

# Containment and Prevention of MDROs in Post-acute and Long-term Care

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**CDC Division of Healthcare Quality Promotion**

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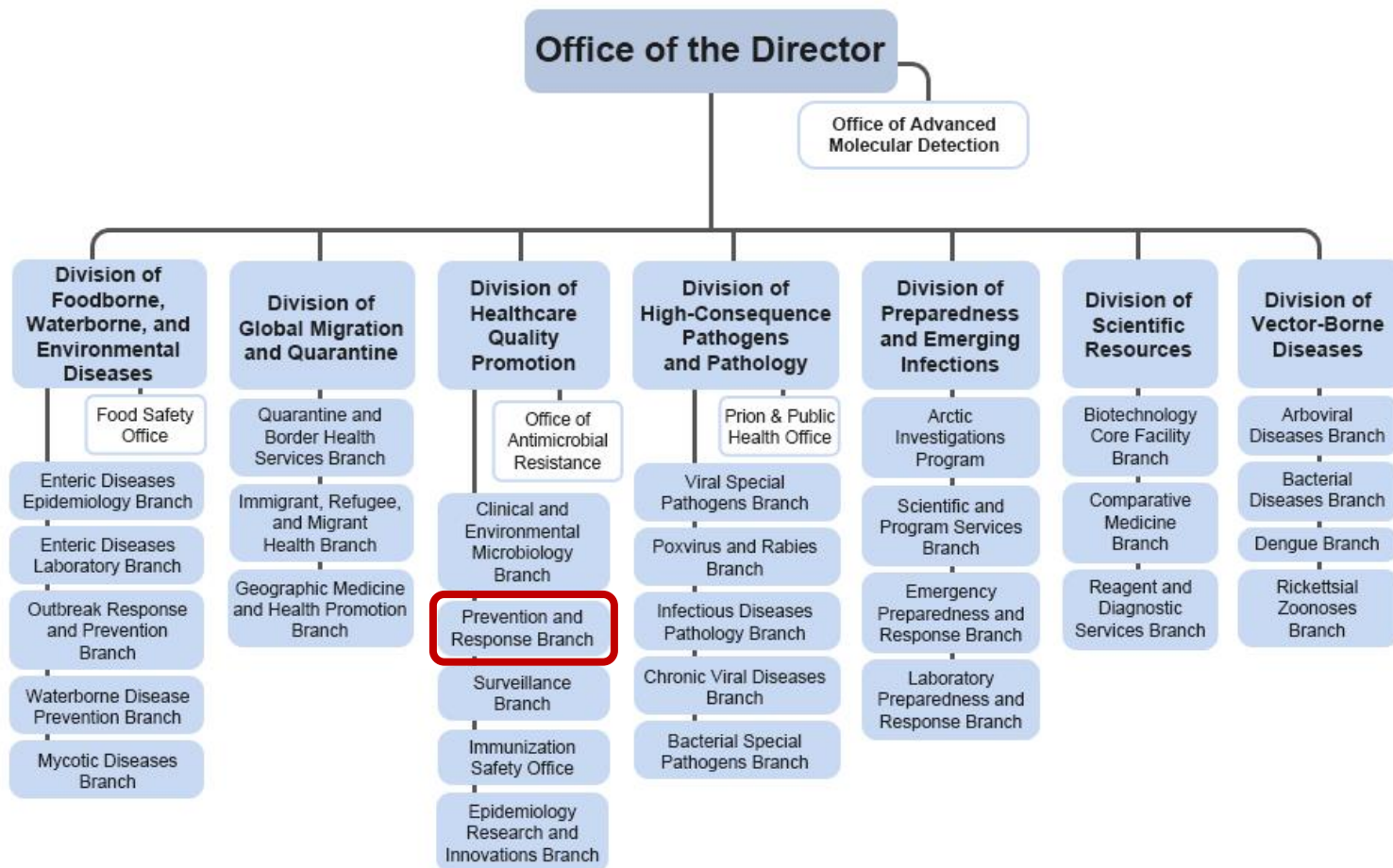
**Michigan Department of health and Human Services**

# Speaker Disclosures

- Kara M. Jacobs Slifka, MD, MPH
  - No conflicts to disclose
  - The content of this presentation reflects my opinion and does not necessarily reflect the official position of the CDC
- Noreen Mollon, MS, CIC
  - No conflicts to disclose

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(NCEZID)  
Centers for Disease Control and Prevention (CDC)





# Division of Healthcare Quality Promotion (DHQP)

- **Investigate and respond** to emerging infections and adverse events in healthcare facilities
- **Support the enhancement of state infrastructure** for elimination of HAIs
- **Develop and disseminate evidence-based guidelines and recommendations** to prevent and control HAIs, antibiotic resistance, and medication errors
- **Provide healthcare facilities, states, and federal agencies with data** for action through the National Healthcare Safety Network (NHSN), a tool for monitoring and preventing healthcare-associated infections, used by healthcare facilities in all 50 states

# Prevention & Response Branch: Long-Term Care Team

- Improve infection surveillance, prevention, and antibiotic stewardship in nursing homes
- Define and measure antibiotic use and antibiotic resistance in nursing homes
- Prevent the spread of novel and emerging resistance
- Promote NHSN reporting as a part of SNF quality measurement programs
- Provide resources and assistance to state and local health departments, post-acute and long-term care facilities

# MDROs in Post-acute and Long-term Care (PA/LTC)

- Contain and Prevent the spread of MDROs
- Develop updated guidance specific to PA/LTC working with regulatory partners
- Provide resources and assistance to state and local health departments, post-acute and long-term care facilities
- Develop a better understanding of the unique challenges faced by nursing homes, especially those providing high-acuity care
- Promote the development of standardized tools and educational materials

Noreen Mollon, MS, CIC  
Surveillance for Healthcare-Associated and Resistant  
Pathogens (SHARP) unit  
Communicable Disease Division  
Bureau of Epidemiology and Population Health  
Michigan Department of Health and Human Services





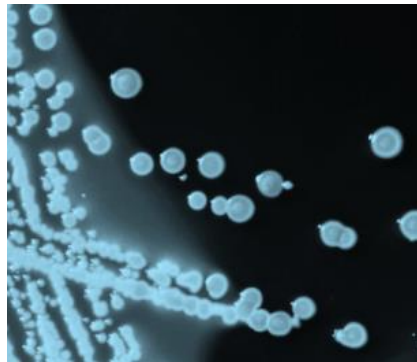
# Surveillance for Healthcare-Associated and Resistant Pathogens (SHARP) Unit

- Objectives of the SHARP Unit:
  - Coordinate activities related to Healthcare-Associated Infection (HAI) surveillance and prevention in Michigan
  - Improve surveillance and detection of antimicrobial-resistant pathogens and HAIs
  - Identify and respond to disease outbreaks
  - Use collected data to monitor trends
  - Educate healthcare providers, state and local public health partners, and the public
  - Connect partners engaged in antimicrobial stewardship activities

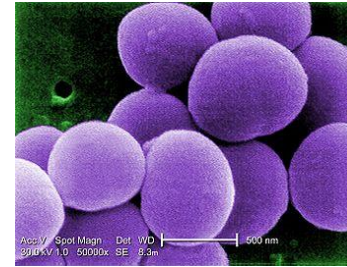


# SHARP Activities

- Outbreak Response
- Infection Control Needs Assessments
- Consulting/Education
- Surveillance and Reporting
- CRE Surveillance and Prevention Initiative



*Klebsiella pneumoniae*



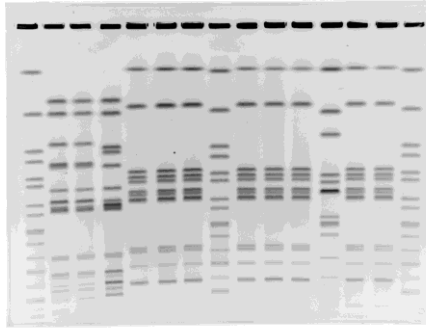
*Staphylococcus aureus*



*Clostridium difficile*

# Outbreak Response

- The MDHHS SHARP staff are available to offer our services and expertise in healthcare-associated outbreak investigations



*Acinetobacter baumannii*

- MDHHS can help facilities coordinate molecular testing with the MDHHS Bureau of Laboratories to identify genetic-relatedness between patient isolates (at no cost)

# Session Objectives

- Discuss the public health importance of multidrug-resistant organisms (MDROs) and emerging pathogens in the post-acute and long-term care settings
- Discuss risk factors for colonization and infection with MDROs
- Describe surveillance and prevention of MDROs in Michigan
- Describe strategies for preventing the spread of MDROs focused on infection prevention practices
  - Define the CDC's containment strategy
  - Discuss Infection Control Assessment and Response Tool and Michigan findings

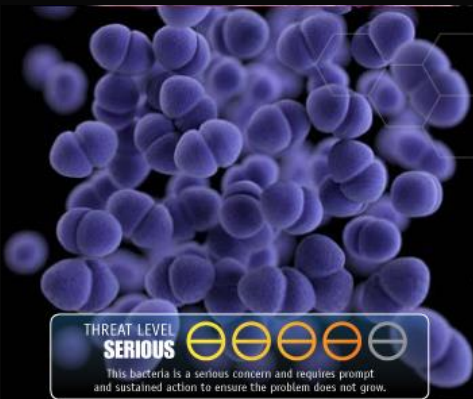
## Case Example

- 70 year old admitted from a long-term acute care hospital to nursing home
  - Complicated hospital history including surgery, prolonged ICU stay, multiple courses of antibiotics
  - Spent 5 weeks in the LTACH
- On transfer, has tracheostomy, PEG tube, indwelling urinary catheter and partially healing sacral pressure ulcer
- One week later, on reviewing the chart, you find results of a culture sent from tracheostomy secretions

## Case Example, continued

- Tracheostomy aspirate culture grew *Klebsiella pneumoniae*,  $>10^5$  cfu

Drug	Result
Amikacin	Intermediate
Ampicillin	Resistant
Amp/Sulbactam	Resistant
Aztreonam	Resistant
Cefazolin	Resistant
Cefepime	Resistant
Ceftazidime	Resistant
Ceftriaxone	Resistant
Cefuroxime	Resistant
Gentamicin	Resistant
Levofloxacin	Resistant
Meropenem	Resistant
Piperacillin/Tazobactam	Resistant
Tobramycin	Resistant
Trimethoprim/Sulfa	Resistant



## VANCOMYCIN-RESISTANT ENTEROCOCCUS (VRE)



**20,000**

DRUG-RESISTANT  
ENTEROCOCCUS INFECTIONS



**1,300**

DEATHS FROM DRUG-RESISTANT  
ENTEROCOCCUS INFECTIONS



**66,000**

ENTEROCOCCUS  
INFECTIONS  
PER YEAR



SOME ENTEROCOCCUS STRAINS ARE RESISTANT TO VANCOMYCIN

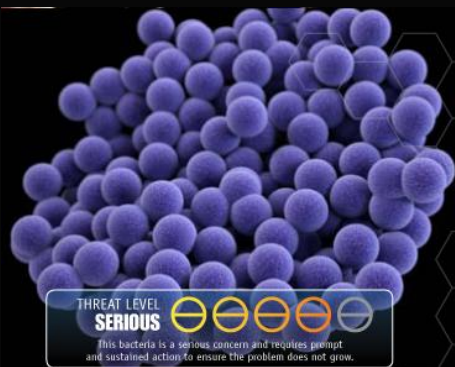
**LEAVING FEW OR NO TREATMENT OPTIONS**



THREAT LEVEL  
**SERIOUS**



This bacteria is a serious concern and requires prompt and sustained action to ensure the problem does not grow.



## METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA)



**80,461**

SEVERE MRSA  
INFECTIONS PER YEAR



**11,285**

DEATHS FROM  
MRSA PER YEAR



STAPH BACTERIA ARE A LEADING CAUSE OF

**HEALTHCARE-ASSOCIATED INFECTIONS**



THREAT LEVEL  
**SERIOUS**



This bacteria is a serious concern and requires prompt and sustained action to ensure the problem does not grow.



## EXTENDED SPECTRUM $\beta$ -LACTAMASE (ESBL) PRODUCING ENTEROBACTERIACEAE



**26,000**

DRUG-RESISTANT  
INFECTIONS



**1,700**

DEATHS



**140,000**

ENTEROBACTERIACEAE  
INFECTIONS PER YEAR



**\$40,000**

IN EXCESS MEDICAL COSTS PER YEAR  
FOR EACH INFECTION



THREAT LEVEL  
**SERIOUS**



This bacteria is a serious concern and requires prompt and sustained action to ensure the problem does not grow.



## Carbapenem Resistant Enterobacteriaceae (CRE)

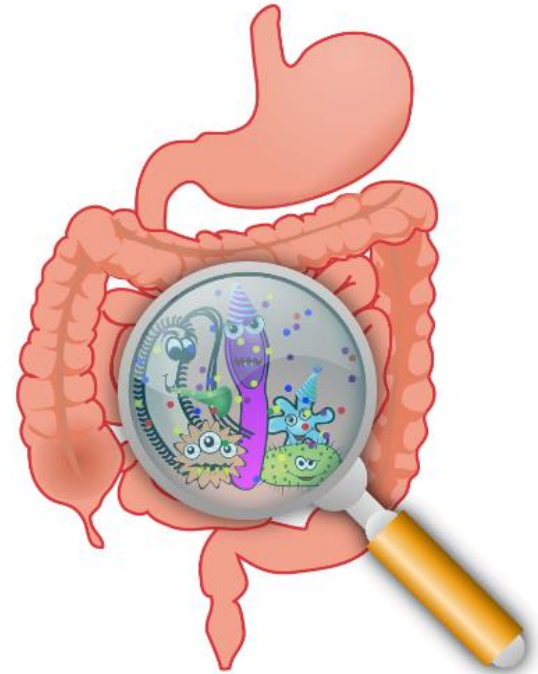


**“Nightmare bacteria”**



# CRE are a public health threat

1. CRE cause invasive infections with high mortality (up to 40-50%)
  - Urinary Tract Infections
  - Bloodstream infections
  - Wound infections
  - Pneumonia



# CRE are a public health threat

1. They cause invasive infections associated with high mortality rates
2. Carry resistance genes on mobile genetic elements that confer high levels of resistance



Leave limited to no therapeutic options



Facilitate spread

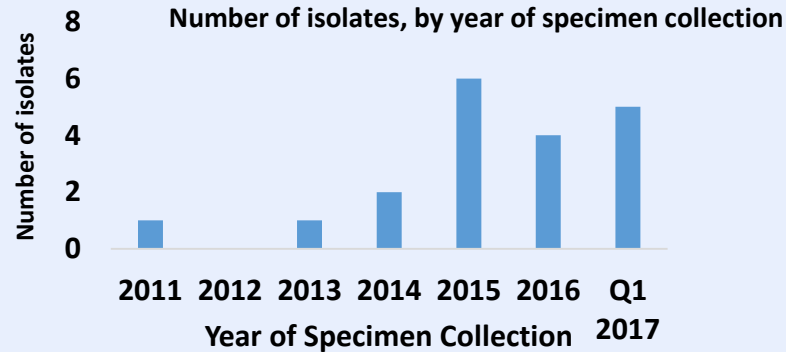
# Carbapenem-resistant Enterobacteriaceae (CRE)

- Multiple different mechanisms can cause resistance
  - Carbapenemase-producing (CP-CRE)
    - **KPC** - *Klebsiella pneumoniae* carbapenemase (most common in U.S.)
    - **NDM** – New Delhi Metallo- $\beta$ -lactamase
    - **VIM** – Verona Integron-encoded Metallo-  $\beta$  -lactamase
    - **OXA** – Oxacillinase-48-type carbapenemase
    - **IMP** – Imipenemase Metallo-  $\beta$  -lactamase
  - Non-carbapenemase-producing (non-CP-CRE)



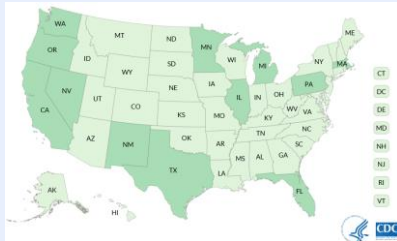
# Carbapenemases in other Gram negative bacteria

*Proteus mirabilis*, *Providencia rettgeri*, *Citrobacter freundii*



Carbapenem-Producing Organisms (CPOs)

*Pseudomonas aeruginosa*



VIM: 86 patients,  
12 states



*Acinetobacter baumannii*

# CPOs are a public health threat

1. They cause invasive infections associated with high mortality rates
2. Carry resistance genes on mobile genetic elements that confer high levels of resistance
3. CRE have spread throughout the United states and other countries and have the potential to spread more widely

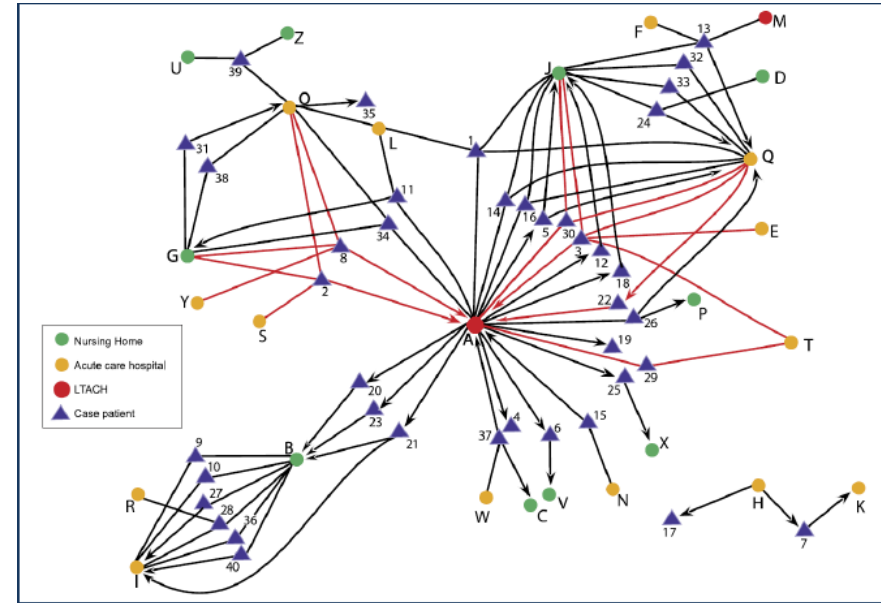


PROBLEM:

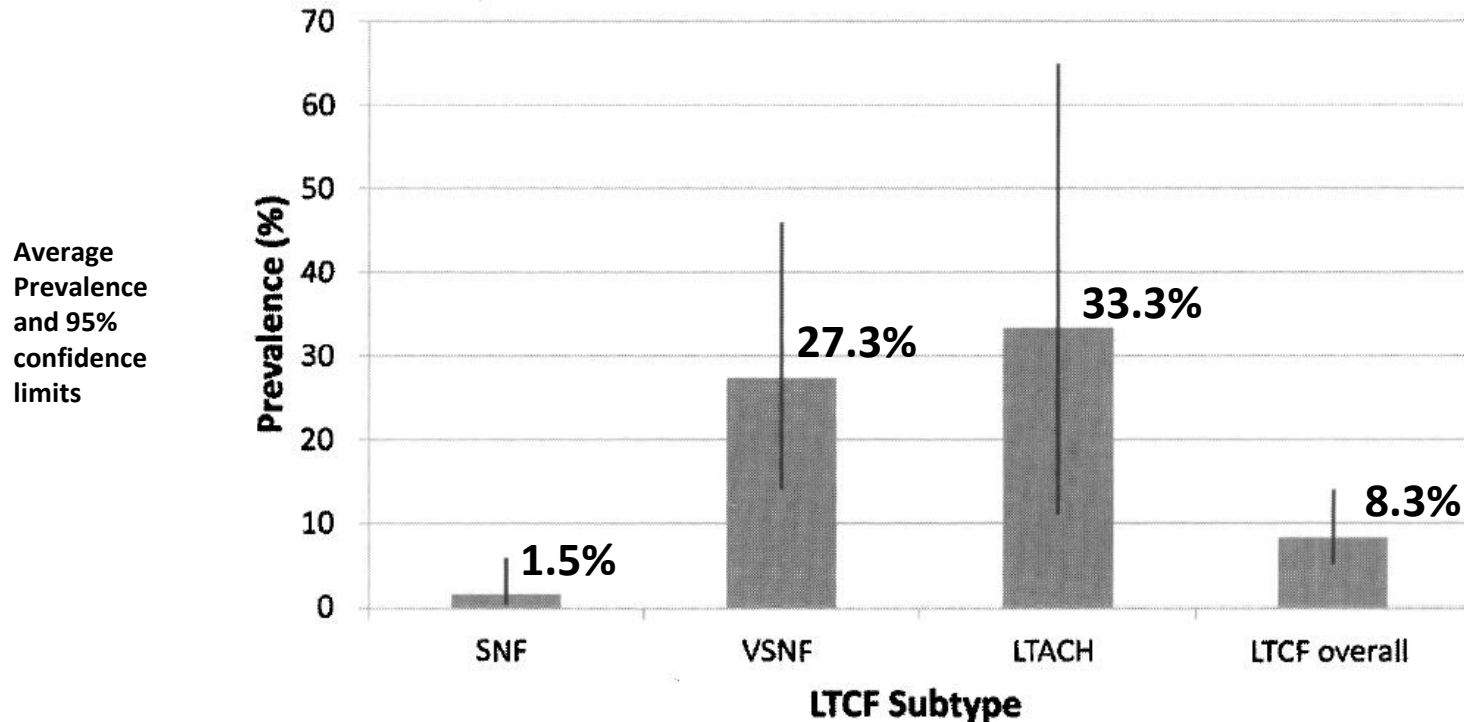
**Antibiotic-resistant germs can spread like wildfire.**

# Healthcare networks driving outbreaks: Findings from public health investigations

- Post-acute care facilities with longer length of stay and high acuity of care (e.g., ventilator services, IV therapy, wound care) expand the burden of resistance within a region
- Gaps in IPC program infrastructure and practices can augment this problem



# Carriage of CP-CRE (*Klebsiella pneumoniae*) among Hospitalized patients admitted from Post-acute/Long-term care, 2012



# Older adults are at high risk for infections with MDROs





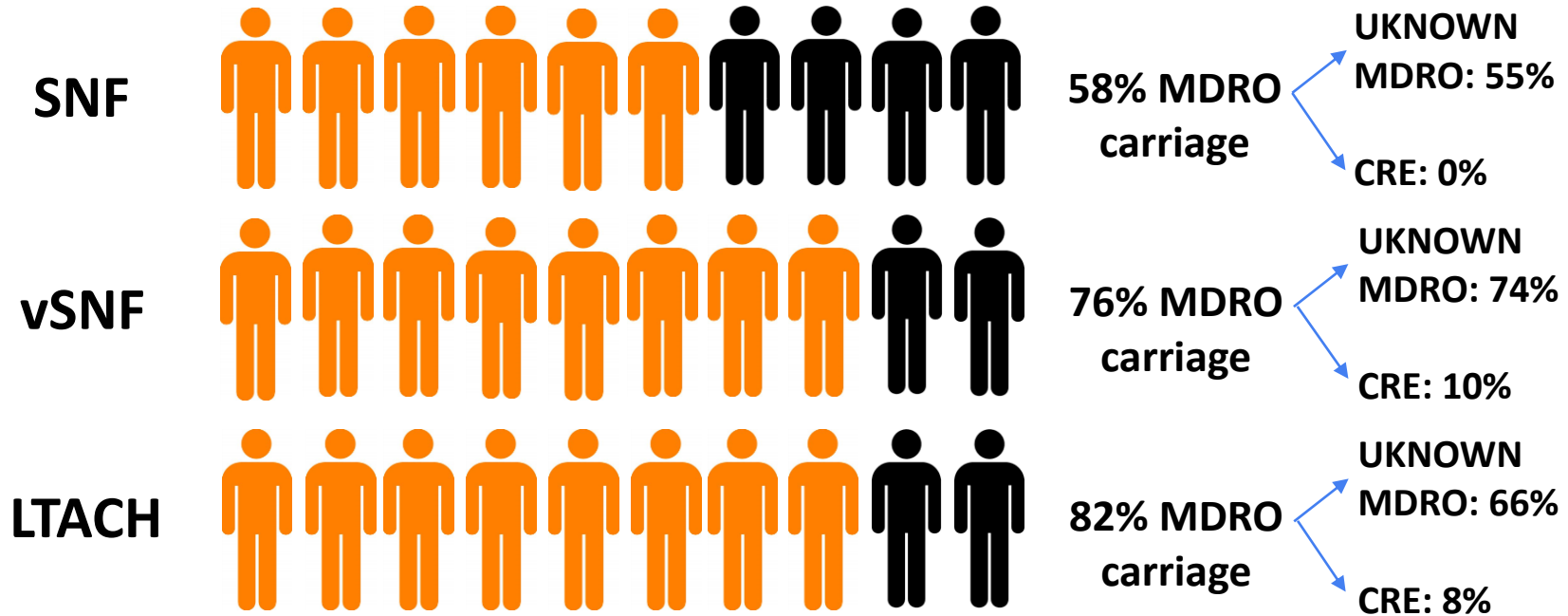
# Risk Factors for colonization with MDROs

- Indwelling medical device (urinary catheter, PEG tube, trach, central line)
- Lower functional status
- Presence of wounds or decubitus ulcers
- Antibiotic use in prior 3 months
- Fluoroquinolone use
- History of hospitalization
- Older age
- Comorbid medical conditions

# Nursing home setting provides opportunity for transmission



## Carriage of ANY MDRO (Median %)



# Carbapenem-resistant *Enterobacteriaceae* Surveillance and Prevention Initiative

- Began in 2012
- Voluntary reporting of CRE
  - *Klebsiella pneumoniae* and *Escherichia coli* resistant to any carbapenem (Sept 2012-Aug 2017)
  - *Klebsiella* spp., *Enterobacter* spp., *Escherichia coli* positive for carbapenemase production by a phenotypic or molecular test or those resistant to ANY carbapenem if no confirmatory testing done (Sept 2017 – current)
- Implementation of a CRE prevention plan
  - Facility-specific based on needs and resources
  - Examples: policy/procedure changes, education, communication, compliance monitoring (hand hygiene, contact precautions), CHG bathing

# CRE Surveillance and Prevention Initiative

## Voluntary Participation

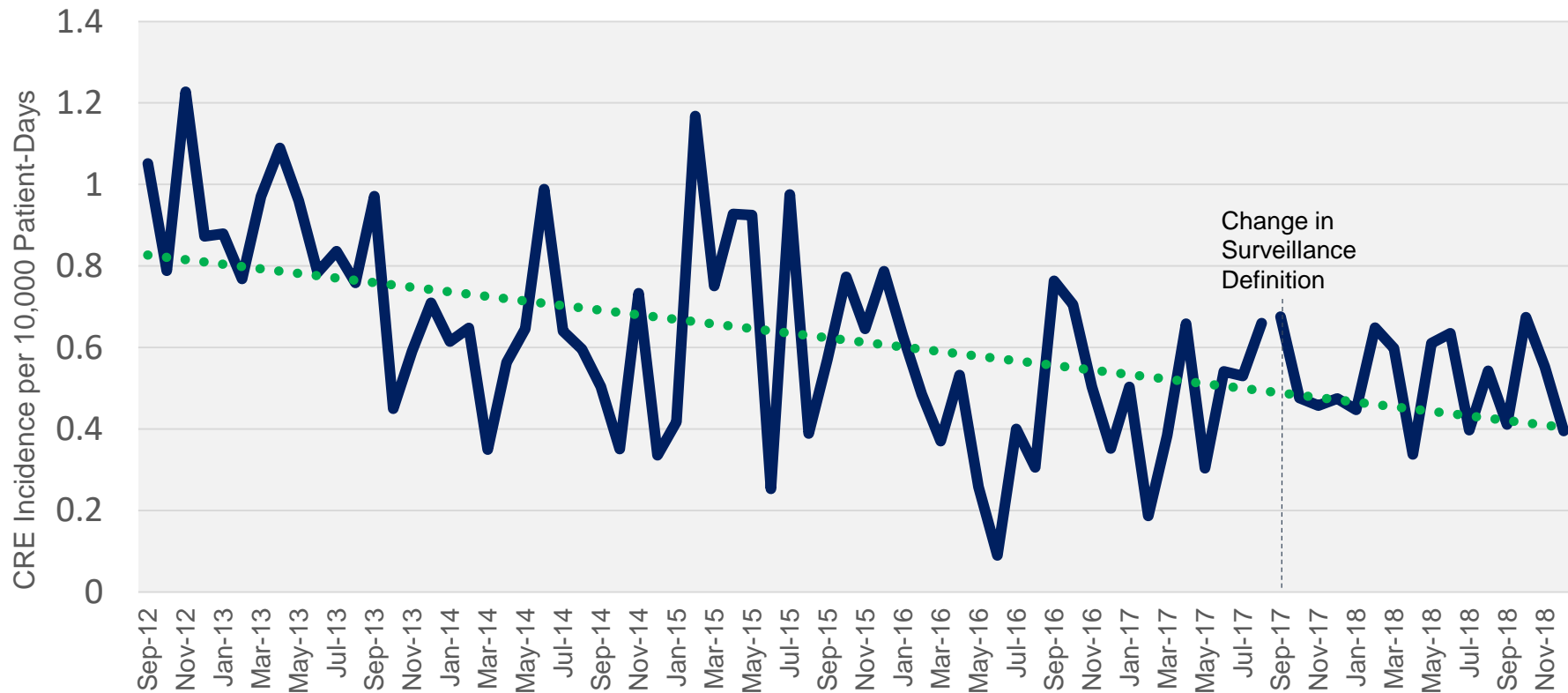
	Baseline Period	Intervention Period	Acute Care	LTAC	LTC/SNF	Total
Phase 1	Sept 2012-Feb 2013	Mar 2013- Aug 2014	17	4	0	21
Phase 2	Mar 2014-Aug 2014	Sept 2014-Feb 2016	7	2	0	9
Phase 3	Sept 2015-Feb 2016	Mar 2016-Aug 2017	4	4	2	10
New facilities	Sept 2017-Feb 2018	Mar 2018-Aug 2019	14	7	0	21
Combined Cohort	Sept 2017-Feb 2018	Mar 2018-Aug 2019	42	17	2	61

A map of Michigan showing all 83 counties. Fifteen counties are highlighted in purple: Baraga, Marquette, Dickinson, Alger, Delta, Charlevoix, Antrim, Otsego, Benzie, Grand Traverse, Kalamazoo, Leelanau, Manistee, Jackson, and Muskegon. The other 68 counties are in white. The Great Lakes are shown in grey. The text 'CRE Initiative' is in the top right corner.

## 61 Facilities in 27 counties

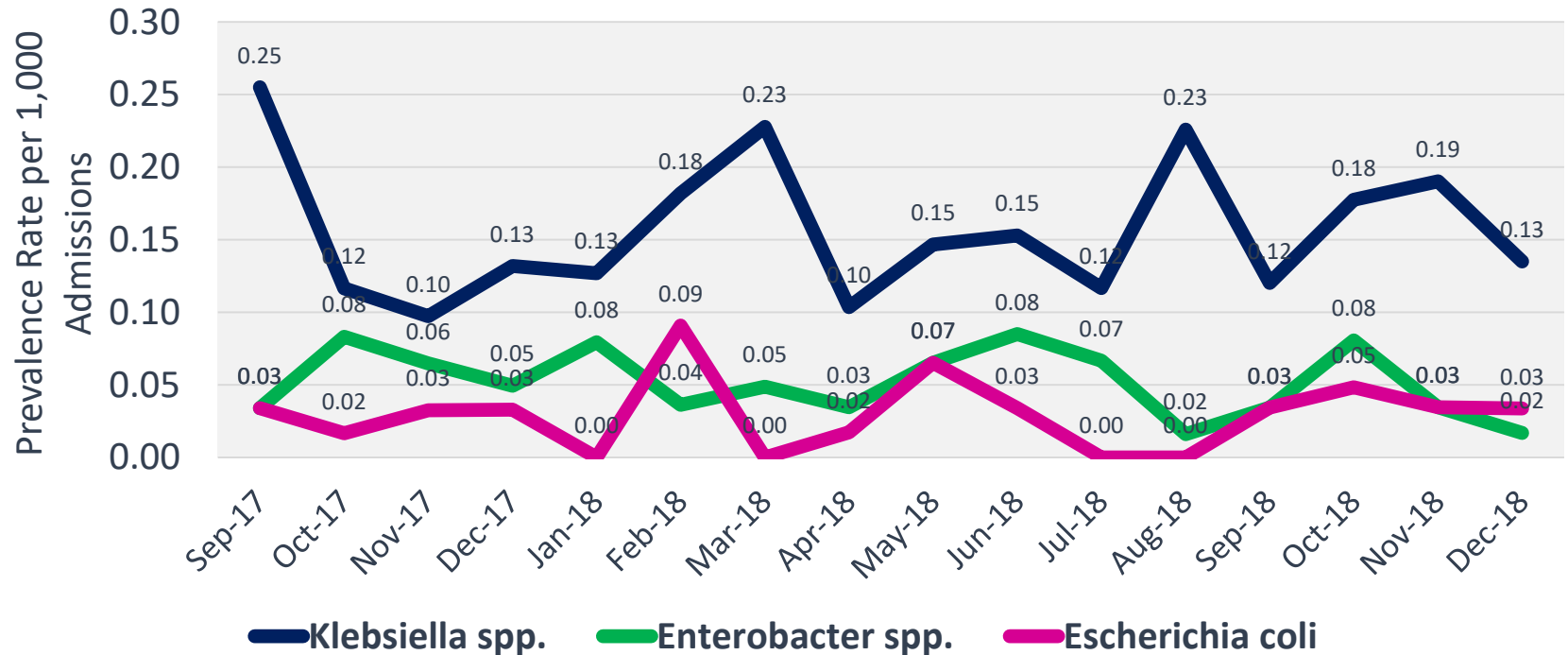
# Overall Inpatient CRE Incidence

Sept 2012 - Dec 2018



# Inpatient CRE Prevalence Rate by Organism

Sept 2017 – Dec 2018





# Carbapenemase-producing CRE Reporting

- Reportable disease in Michigan starting January 2018
- Surveillance definition endorsed by CSTE/CDC
- CP-CRE cases are reported using the Michigan Disease Surveillance System (MDSS)
  - Web-based communicable disease reporting system for the state of Michigan
  - Cases can be reported by:
    - Electronic laboratory report (ELR)
    - Manual case entry

# CP-CRE Reporting Requirements

- Laboratories, infection prevention and Local Health Departments are required to report all cases of **CP-CRE** according to the following criterion for *Klebsiella spp.*, *E. coli*, or *Enterobacter spp.*:
  - Healthcare record contains a diagnosis of Carbapenemase-producing Carbapenem-resistant Enterobacteriaceae (CP-CRE), KPC, NDM, OXA-48, IMP or VIM or other novel carbapenemase
  - Any isolate of *Klebsiella spp.*, *E. coli*, or *Enterobacter spp.* demonstrating carbapenemase production by a **phenotypic test** (e.g., Carba NP, CIM, mCIM)
  - Any isolate of *Klebsiella spp.*, *E. coli*, or *Enterobacter spp.* with a known carbapenemase resistance mechanism (e.g., KPC, NDM, OXA-48, IMP, VIM, or other carbapenemase gene) by a recognized **molecular test** (e.g., PCR, Expert Carba-R)

# CP-CRE Reporting Requirements

- If laboratories are unable to detect **CP-CRE**, (*i.e.*, cannot test for carbapenemase production (phenotypic) or resistance mechanism (molecular test):
  - Report any isolate of *Klebsiella spp.*, *E. coli*, or *Enterobacter spp.* with a minimum inhibitory concentration (MIC) of any of the following:
    - $\geq 4$  mcg/ml for Meropenem
    - $\geq 4$  mcg/ml Imipenem
    - $\geq 4$  mcg/ml Doripenem
    - $\geq 2$  mcg/ml for Ertapenem

# Case Classification

## CONFIRMED CP-CRE

- *Klebsiella spp., E. coli, Enterobacter spp.*
  - Positive **phenotypic test** OR
  - Positive **carbapenem resistance mechanism**

## SUSPECT CP-CRE

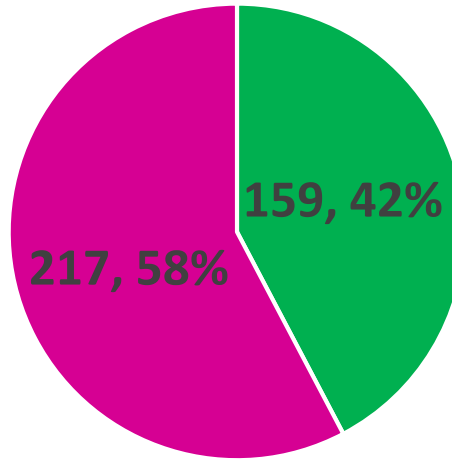
- *Klebsiella spp., E. coli, Enterobacter spp.*
  - Resistance to at least 1 carbapenem
  - No phenotypic or molecular testing done

## NOT a CASE

- BOL report is negative for phenotypic and molecular tests
- All carbapenems are susceptible (MICs don't match case definition)
- Not *Enterobacteriaceae*

# CP-CRE Cases Reported to MDSS

Jan – Dec 2018



■ Confirmed ■ Suspect

# CP-CRE Cases by Organism

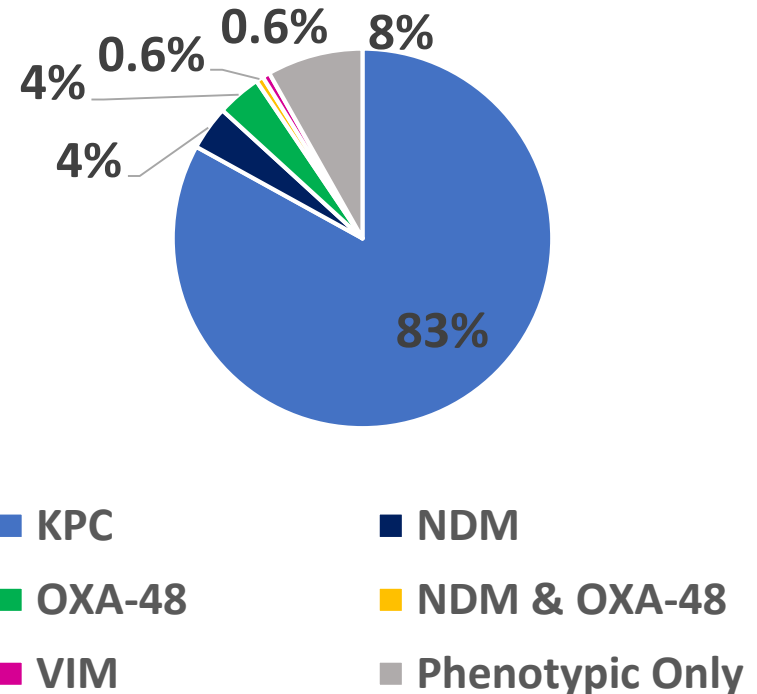
Jan – Dec 2018

Organism	CP-CRE Cases		
	Confirmed n=159	Suspect n=217	Total n=376
<b><i>Klebsiella spp.</i></b>	<b>110 (69%)</b>	<b>89 (41%)</b>	<b>199 (53%)</b>
<i>Klebsiella pneumoniae</i>	102	68	170
<i>Klebsiella aerogenes</i>	4	14	18
<i>Klebsiella oxytoca</i>	3	7	10
<i>Klebsiella variicola</i>	1	0	1
<b><i>Escherichia coli</i></b>	<b>23 (14%)</b>	<b>69 (32%)</b>	<b>92 (42%)</b>
<b><i>Enterobacter spp.</i></b>	<b>26 (16%)</b>	<b>36 (17%)</b>	<b>85 (23%)</b>
<i>Enterobacter cloacae</i>	26	57	83
<i>Enterobacter asburiae</i>	0	1	1
<i>Enterobacter hormaechei</i>	0	1	1

# Confirmed CP-CRE

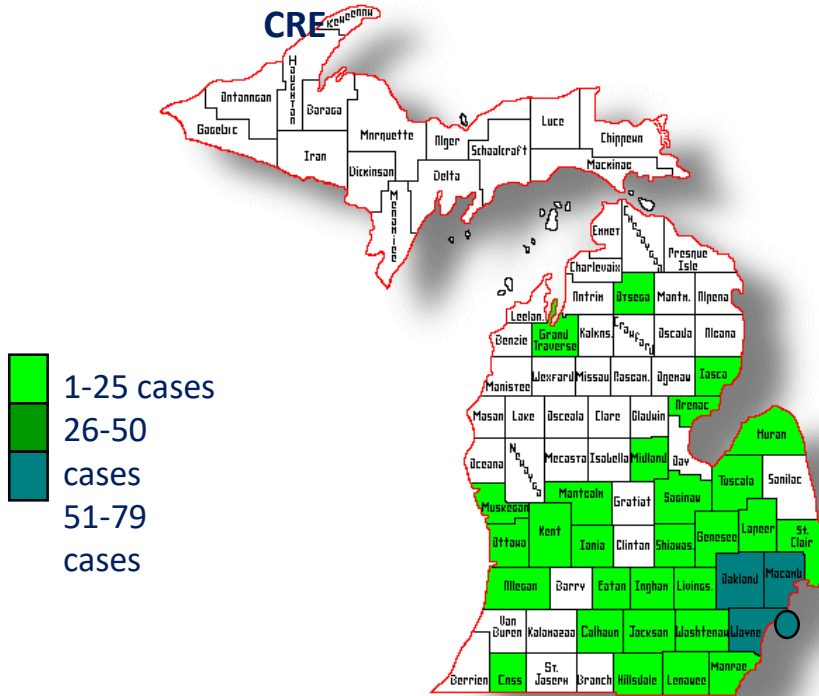
Jan – Dec 2018

- 159 positive for carbapenemase production by a **phenotypic test** (e.g., mCIM, MHT)
- 146 results available for **resistance mechanism**
  - 132 KPC
  - 6 NDM-1
  - 6 OXA-48
  - 1 NDM-1 & OXA-48
  - 1 VIM

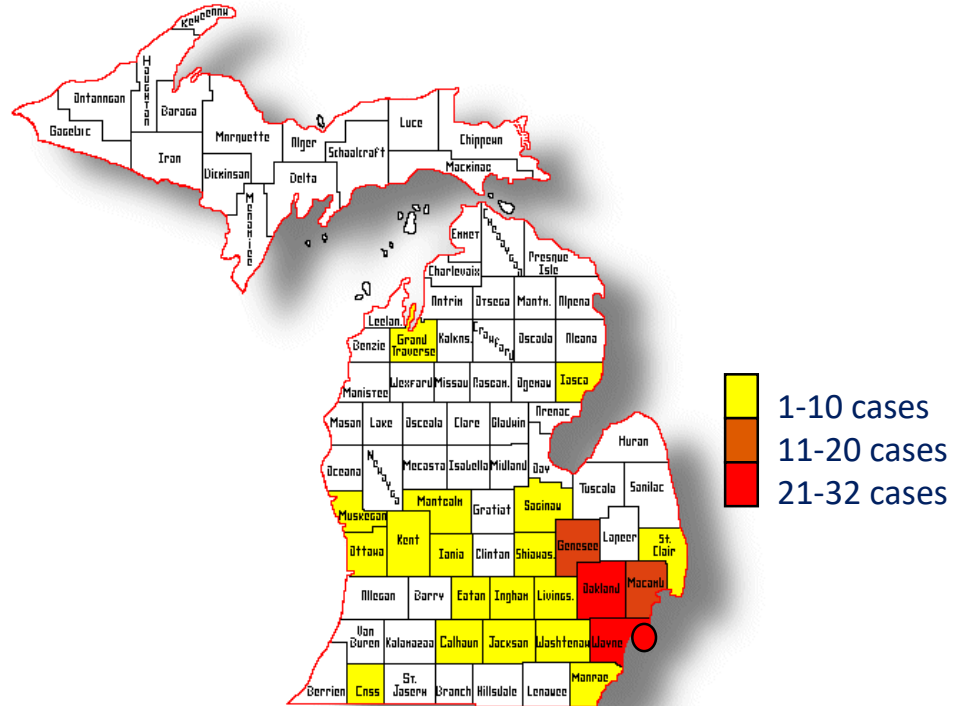


# CP-CRE Cases by County\*, 2018

Confirmed and Suspect CP-CRE



Confirmed CP-CRE only



\*based on county of residence



# CP-CRE and Novel Resistance Activity

- **Carbapenemases:**

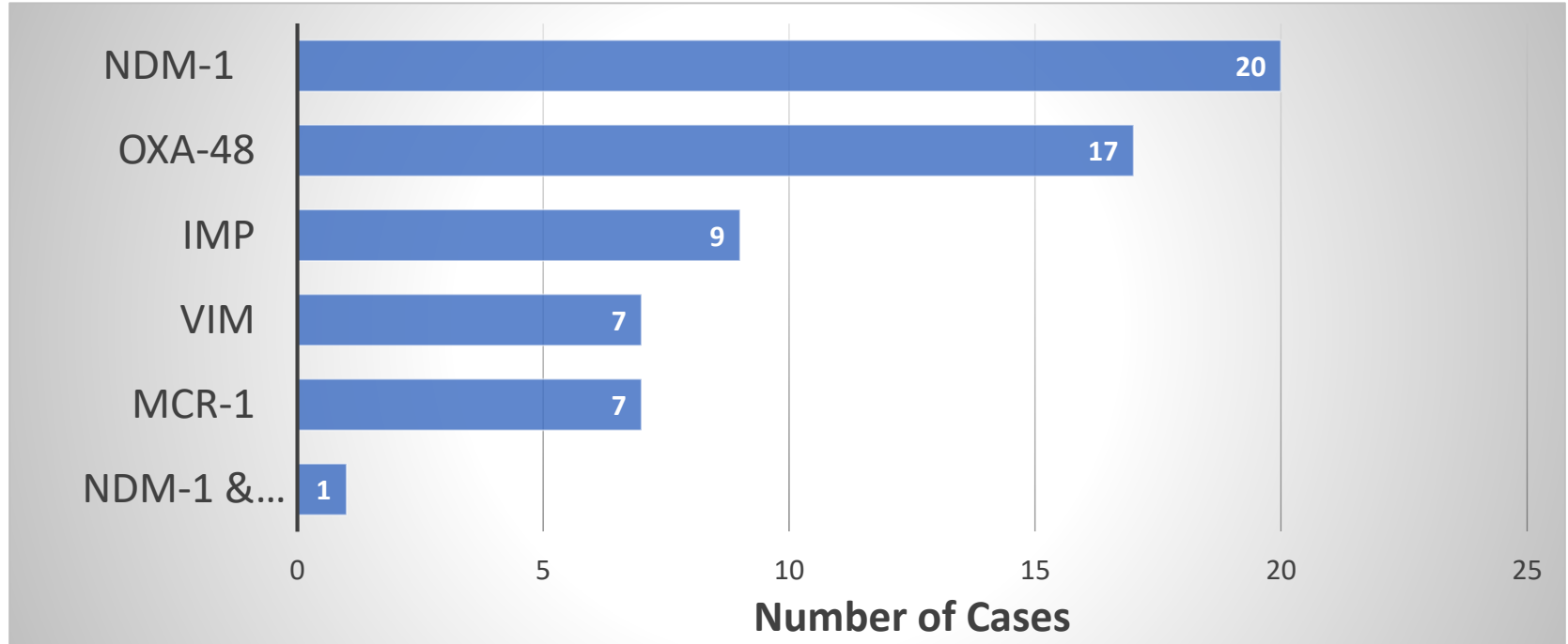
- *Klebsiella pneumoniae* carbapenemase (KPC)
- New Delhi metallo- $\beta$ -lactamase (NDM)
- Verona integron encoded metallo- $\beta$ -lactamase (VIM)
- Imipenemase metallo- $\beta$ -lactamase (IMP)
- Oxacillinase-48 (OXA-48)

- **Other resistance elements:**

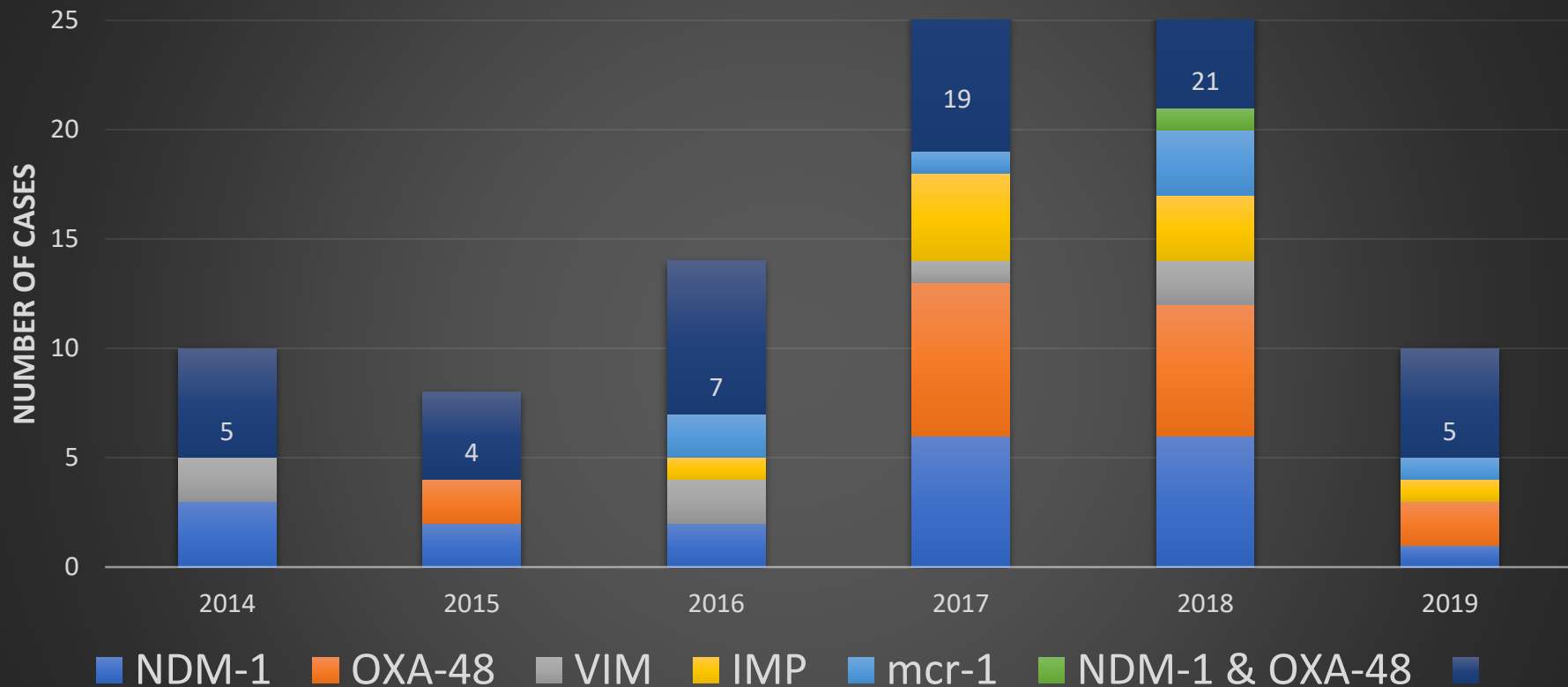
- Mobile colistin resistance (mcr)

# Confirmed Novel Resistance Cases

## 2014 - Current



# Confirmed Novel Resistance Cases by Year



# Novel Resistance Case Demographics



**Median Age, 62  
yrs**

(range 5 – 87 yrs)



**Male, 32 (52%)**



**Comorbid  
conditions**

Cardiovascular disease – 39%

Diabetes – 33%

Chronic lung disease – 21%

Renal failure, chronic wound –  
20%

Malignancy, vent dependent -11%

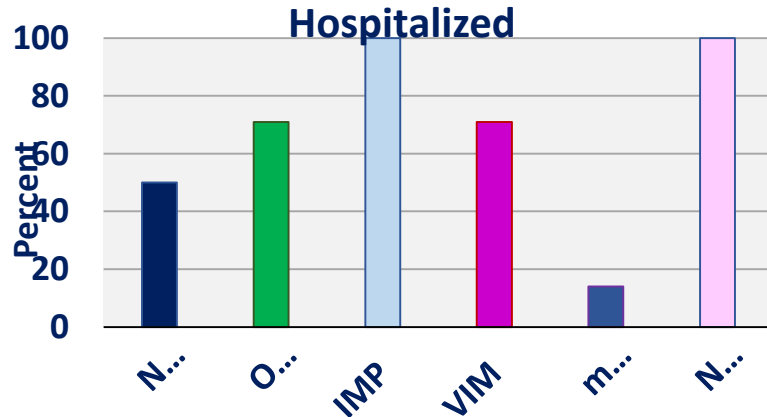
Urinary catheter – 10%

dementia - 7%

# Common Risk Factors for Novel Resistance

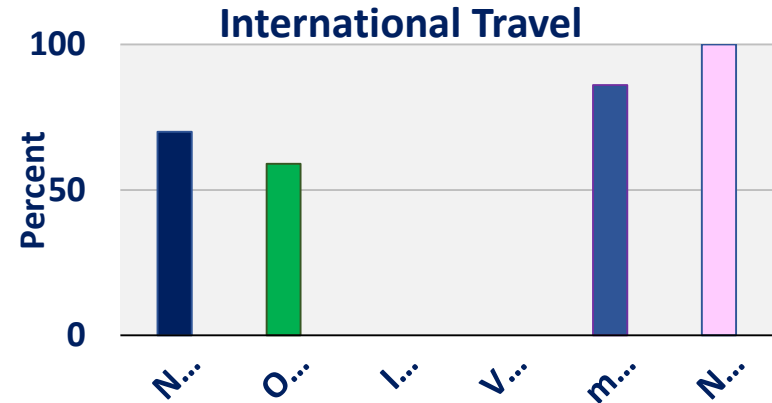
## Healthcare Exposures

- 62% were hospitalized 6 months prior to positive culture



## International Travel

- 51% had travel 6 months prior to positive culture



# Carbapenemase and Resistance Mechanism Testing

- Laboratories are *strongly encouraged to submit CRE isolates* to the MDHHS Bureau of Laboratories
  - Confirm organism identification
  - Perform modified carbapenem inactivation method (mCIM) testing
  - Perform PCR testing for KPC, NDM, OXA-48 like, IMP, VIM
    - If mCIM or PCR are positive, antimicrobial susceptibility testing (AST) will be performed

*Candida  
auris*



THERE'S A FUNGUS  
AMONG US.

# *Candida* can cause serious infections

- Candidemia is the most common HAI bloodstream infection
- 30% mortality
- Risk factors include:
  - Broad-spectrum antibiotic use
  - Central venous catheters
  - Immune compromise





# *Candida auris* presents new challenges

1. Often misidentified



# *Candida auris* presents new challenges

1. Often misidentified
2. Resistant to antifungal drugs

## Polyenes



30%  
resistant

## Azoles



90%  
resistant

## Echinocandins



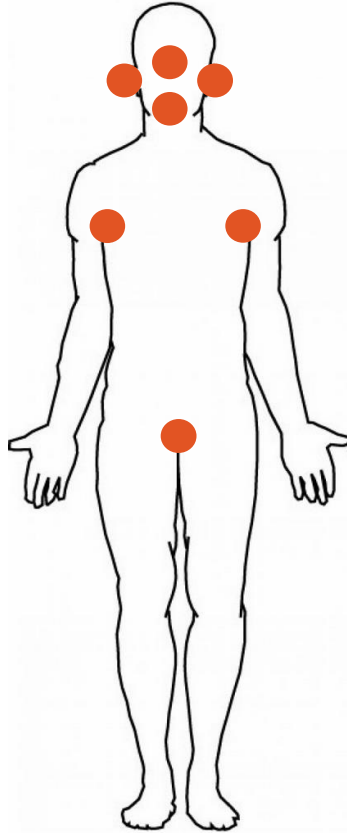
3%  
resistant

# *Candida auris* presents new challenges

1. Often misidentified
2. Resistant to antifungal drugs
3. Causes invasive infections with high mortality



## C. auris Colonizes Skin and Other Body Sites



Colonization poses a risk for:

- Invasive infection
- Transmission to others

## Risk Factors for *Candida auris*

- Older age
- Multiple healthcare stays (post-acute and long term)
- Prolonged healthcare stay
- Taking antibiotics and antifungals
- Tracheostomy
- Ventilator
- Feeding tubes
- Central lines



# *Candida auris* colonizes the environment



Madder et al (U.K.), bioRxiv 2017)  
Armstrong et al, unpublished

# *Candida auris* presents new challenges

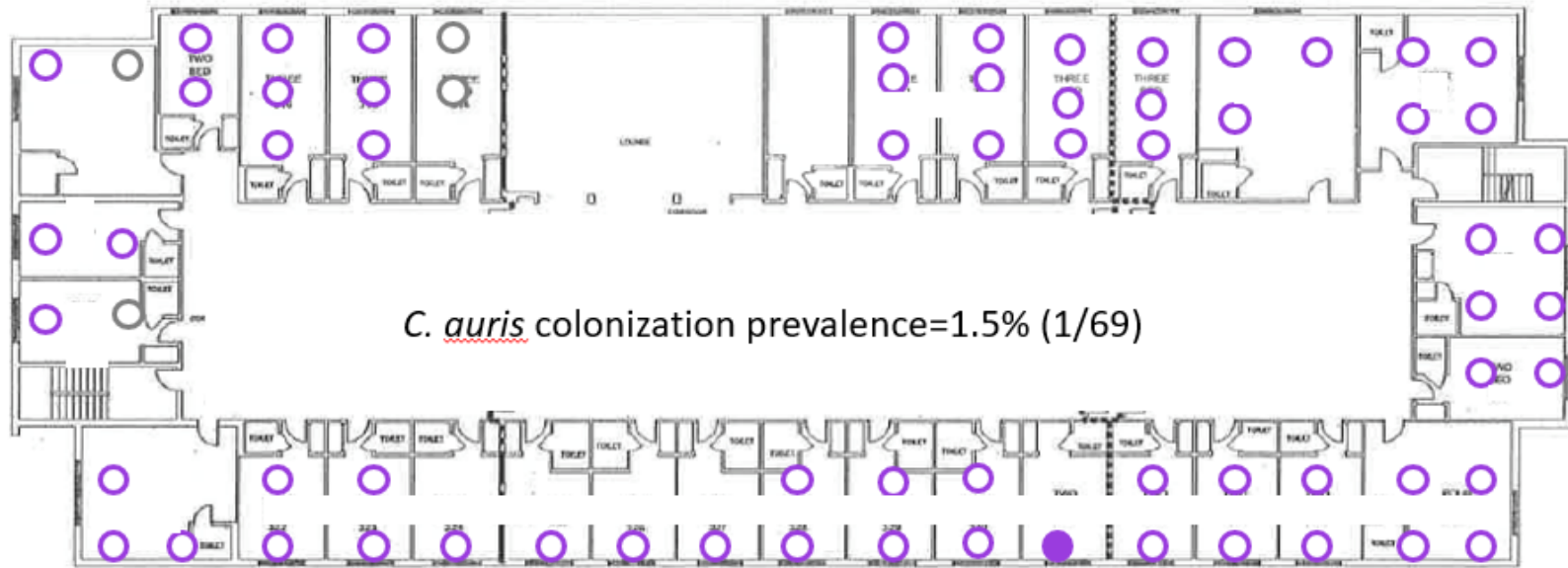
1. Often misidentified
2. Resistant to antifungal drugs
3. Causes invasive infections with high mortality
4. Can cause outbreaks in healthcare settings

**All the  
makings  
of a fungal  
superbug!**



# **vSNF A Ventilator/Trach Floor**

## **March 2017 *C. auris* PPS Results**

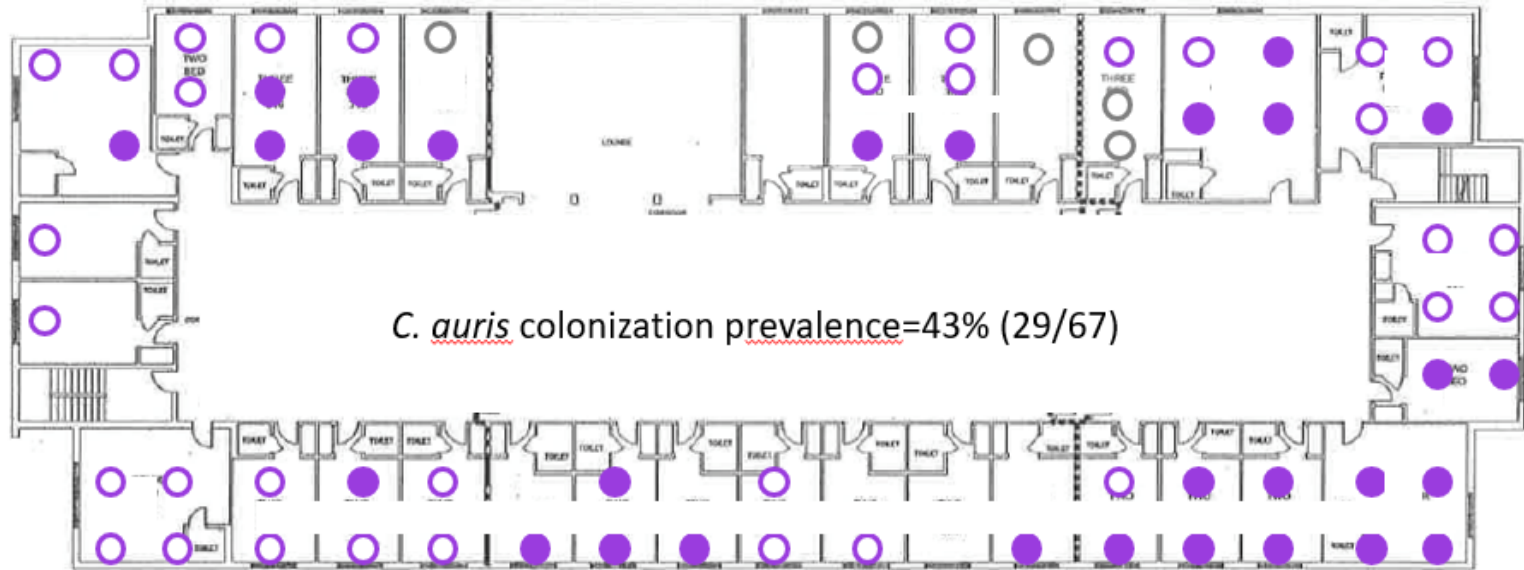


- *C. auris* positive
- Screened negative for *C. auris*
- Not tested for *C. auris* (refused or not in room)



# **vSNF A Ventilator/Trach Floor**

## **January 2018 *C. auris* PPS Results**



- *C. auris* positive
- Screened negative for *C. auris*
- Not tested for *C. auris* (refused or not in room)

# Characteristics of MDROs in PA/LTC

## Resistance



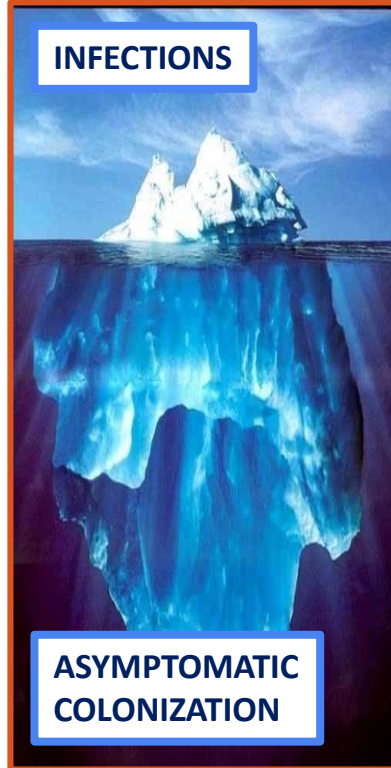
CRE  
CRPA  
Pan-resistant  
organisms  
*Candida auris*



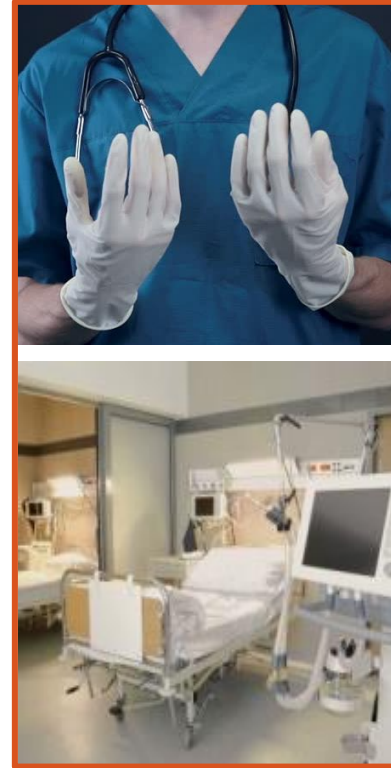
### GENOTYPES

IMP  
KPCNDM  
VIM  
OXA  
MCR

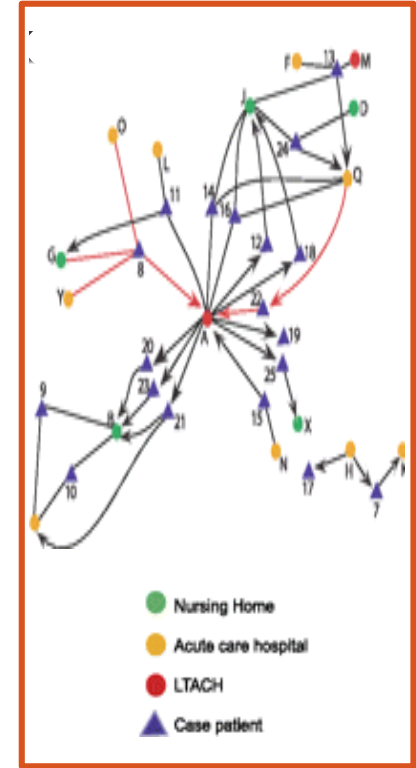
## Detection



## Transmission



## Spread



# *Candida auris* in Michigan

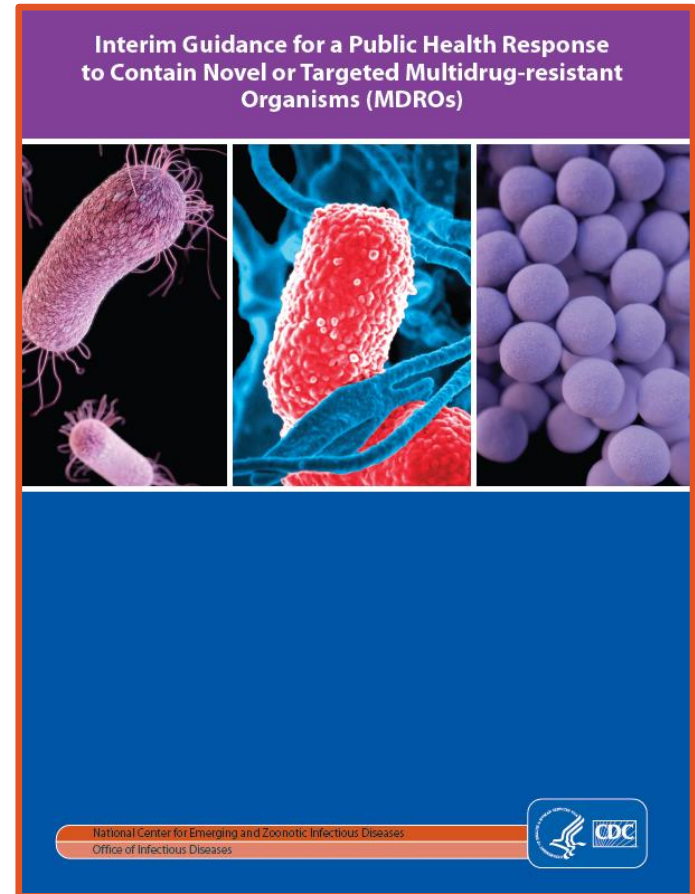
- In 2019, CSTE and CDC passed a position statement to make *C. auris* nationally notifiable. Michigan followed suit and as of January 1, 2019 it is reportable in Michigan
- Please report any patient or laboratory finding to MDHHS that meets either of the following criteria:
  - Detection of *C. auris* in a specimen using either culture or a culture independent diagnostic test (CIDT) (e.g., Polymerase Chain Reaction [PCR])
  - Detection of an organism that commonly represents a *C. auris* misidentification in a specimen by culture (i.e., *Candida haemulonii*): <https://www.cdc.gov/fungal/diseases/candidiasis/pdf/Testing-algorithm-by-Method-temp.pdf>
- The important thing to note is *Candida auris* is bad. This is not your average yeast. This will require extensive investigation. <https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html>



## Containment and Prevention of MDROs

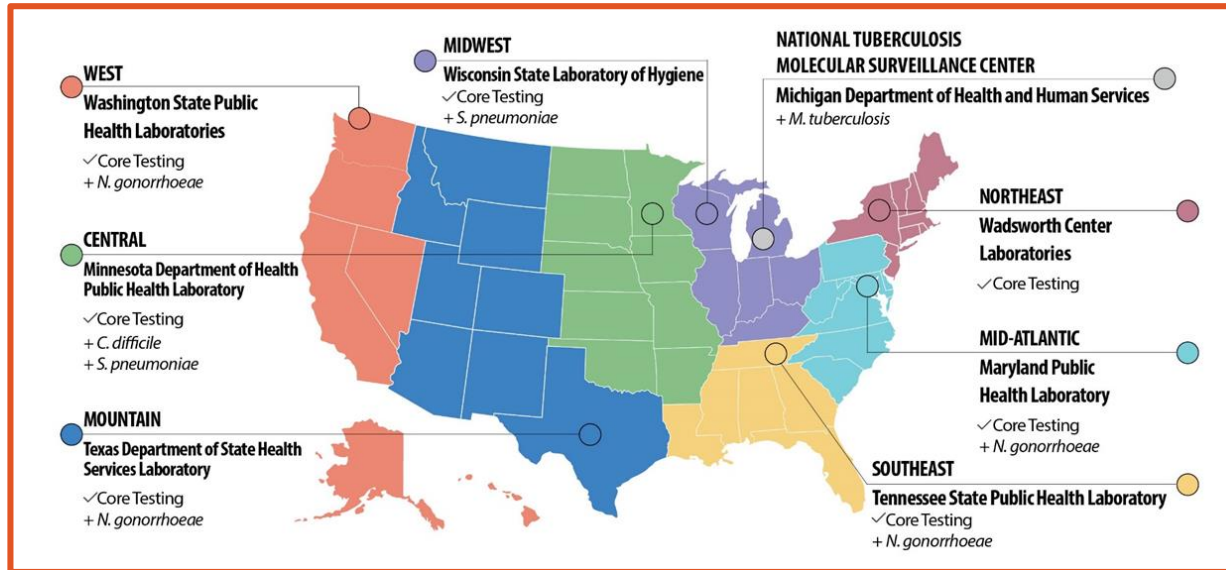
# CDC Containment Strategy

- Systematic approach to slow spread of novel or rare multidrug-resistant organisms or mechanisms through aggressive response to  $\geq 1$  case
  - Pan-resistant organisms
  - Carbapenemase-producing organisms
  - *mcr-1*
  - *Candida auris*
- Response based on pathogen/resistance mechanism



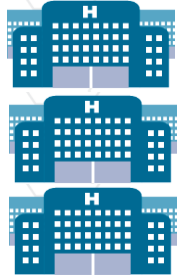
# Antibiotic Resistance Laboratory Network (ARLN)

- Tiered network established in 2016 to support nationwide lab capacity to rapidly detect antibiotic resistance in healthcare, food, and the community
- Public health laboratories in 50 states, 6 cities and Puerto Rico
  - Carbapenemase testing for CRE and CR-*Pseudomonas aeruginosa*

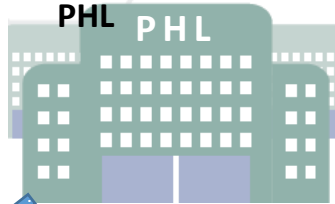


# ARLN: Enhanced Capacity Through Tiered Testing

Network of participating  
clinical laboratories



State/Local  
PHL PHL



## CRE and CRPA

- Organism identification
- Confirmatory AST
- Phenotypic screening for carbapenemase production
- Molecular detection of mechanism

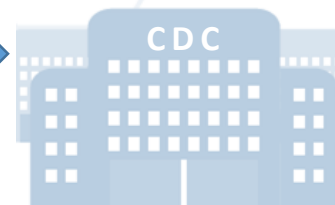
Regional lab



## Healthcare-associated infections

- Confirmatory testing: full directory
- Colonization screening
- Targeted surveillance for emerging AR threats

CDC



- Confirmatory testing
- Whole Genome Sequencing
- Applied research



# MDHHS Bureau of Labs



- Bureau of Laboratories has expanded test offerings to include:
  - Enterobacteriaceae, *Acinetobacter*, and *Pseudomonas aeruginosa*
  - Confirmation of carbapenemase production and colistin resistance
  - Genetic markers for KPC, NDM, VIM, OXA-48, and MCR-1
  - Perform modified carbapenem inactivation method (mCIM) testing



# Containment Strategy

Systematic public health response to slow the spread of emerging AR



# Containment Strategy

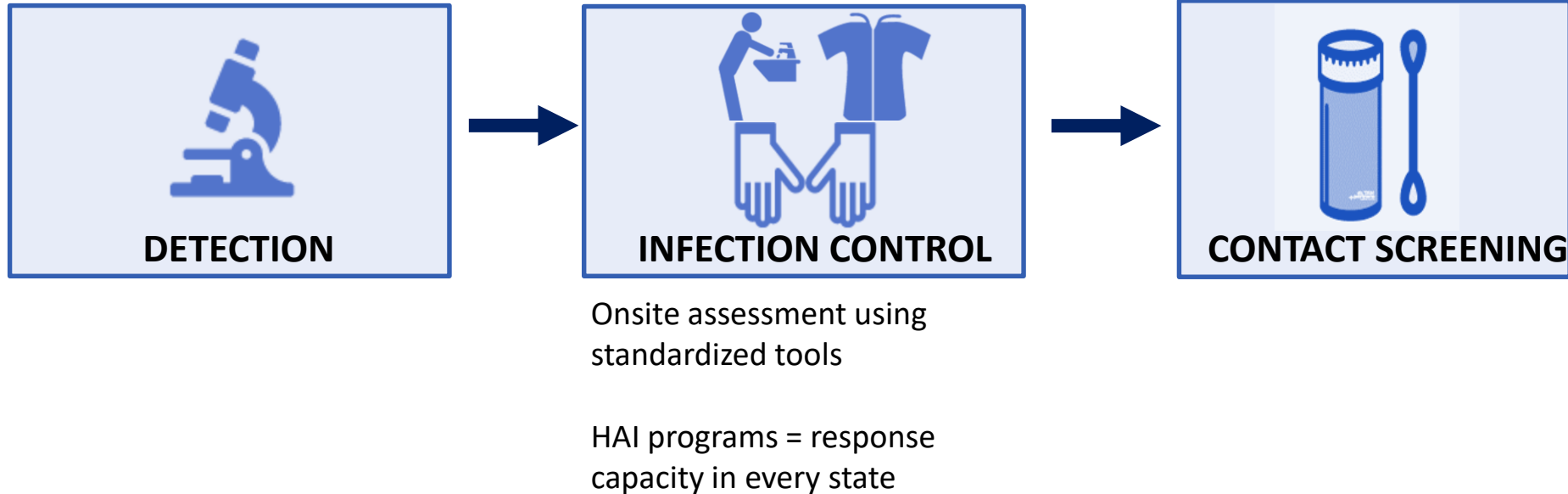
Systematic public health response to slow the spread of emerging AR



**Single case** of emerging resistance

# Containment Strategy

Systematic public health response to slow the spread of emerging AR



# Containment Strategy

Systematic public health response to slow the spread of emerging AR



**DETECTION**



**INFECTION CONTROL**

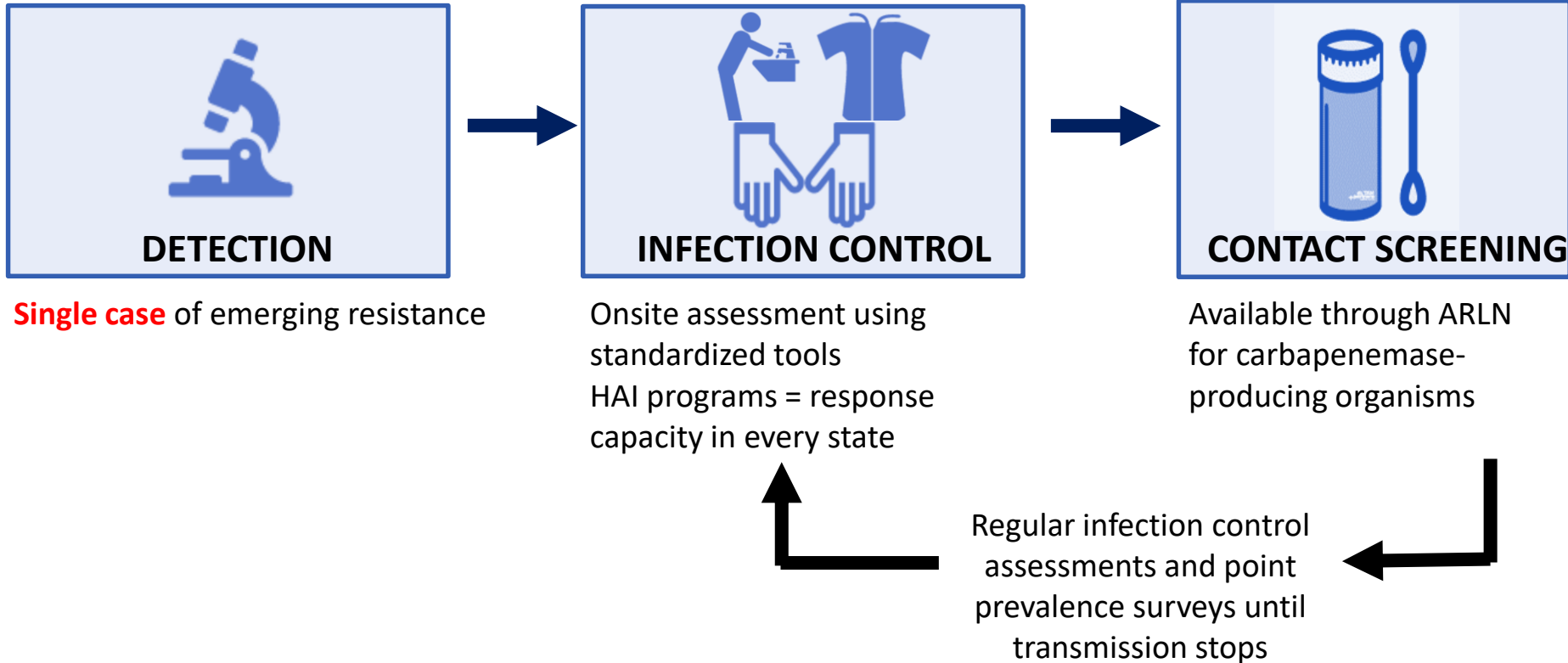


**CONTACT SCREENING**

Available through ARLN  
for carbapenemase-  
producing organisms

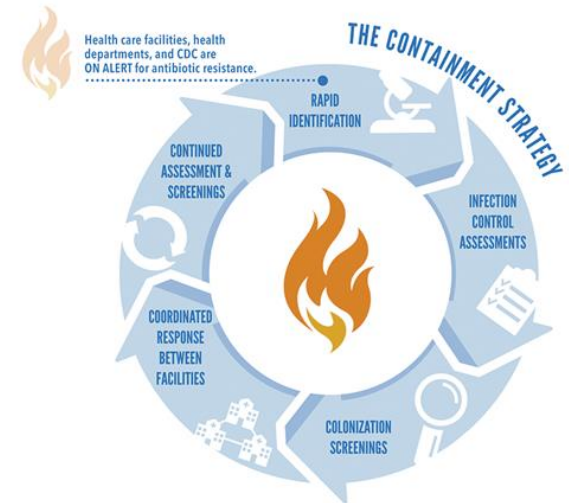
# Containment Strategy

Systematic public health response to slow the spread of emerging AR



# What to expect during a response?

- You have a critical role in containing emerging antibiotic resistance
- If unusual resistance identified in a resident at your facility or who has been in your facility
  - The health department will reach out about infection control assessments (ICAR) and contact screening
  - Focus is on preventing spread of resistance



# Common Themes from CRE and CRPA Responses

- Residents in long length of stay, high acuity settings at highest risk
- Factors in transmission
  - Gaps in adherence to hand hygiene and Contact Precautions
  - Environmental contamination, including improperly cleaned equipment from contracted providers
  - Resident supplies in sink splash zone
  - Failure to communicate resident status at transfer
- Larger clusters take longer to control
  - Multiple on-site visits to observe infection control and multiple rounds of PPS
  - Staff training on hand hygiene, PPE use, environmental cleaning

# ICAR Goals

- Increase patient safety
- Expand infection control resources
- Increase the number of infection control consultations provided by the SHARP unit





# Methods

- Used a CDC tool to conduct infection control needs assessments
- Review facility practices:
  - Infection Control Infrastructure
  - Infection Control Training, Competency, and Implementation of Policies and Practices
  - Systems to Detect, Prevent and Respond to Healthcare-Associated Infections and Multi-Drug Resistant Organisms

# The CDC Evaluation Tool

Organized into 4 sections:

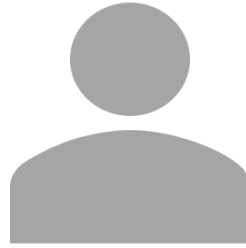
1. Facility demographics
2. Infection control program and infrastructure
  - 9 domains
3. Direct observation of facility practices (optional)
4. Infection control guidelines and other resources



# Assessment and Response



**Discuss findings with  
Infection  
Preventionists and  
other staff**



**Report facility  
findings back to  
facility leadership**



**Aggregate findings**

Strengths

Areas for opportunity

# Facility Recruitment: 2015-2018

- Voluntary participation
- Collaborative, NOT regulatory
- Advertised to interested facilities:
  - Website, flyers, emails
  - Professional societies (e.g. MSIPC, APIC GL, HCAM)
  - Meetings and conference presentations



# Facility recruitment: 2019-

- Response to HAI outbreak
- Response to identification of a novel organism
- Volunteer!

# Participating LTC Facilities

- 41 assessments completed in LTC from 2015-2018
- 28 (68%) assessments completed on-site
- All facilities were licensed by the state
- 39 (95%) were certified by CMS
- Mean licensed beds: 110 beds (range 46-260)
- Staff hours per week dedicated to IP: 22.4 hours (range 2-40)

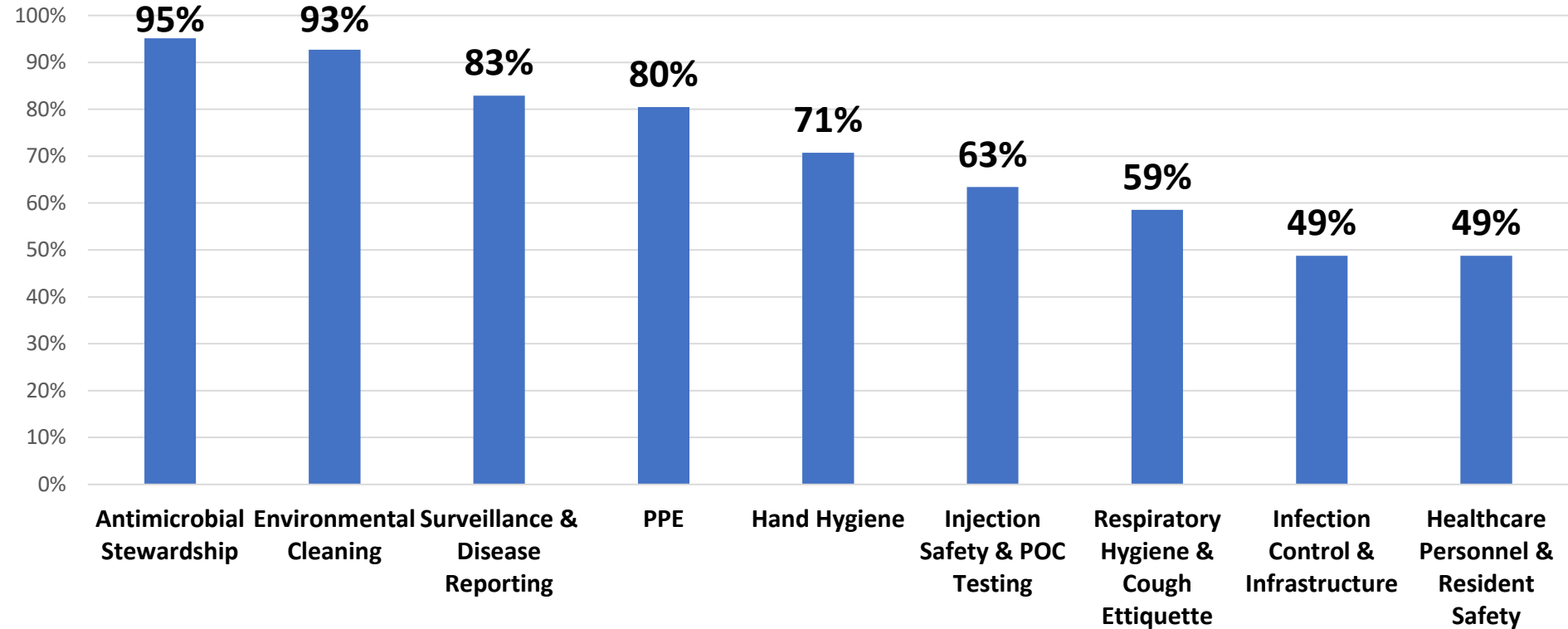


# ICAR Results



- Gaps were common
- Assessments identified at least 1 gap in each facility

# Facilities with at Least 1 Gap by Domain





# Recommendations



- Antimicrobial Stewardship
  - 30 (73%) Develop policies and procedures
  - Develop education and training for staff
- Environmental Cleaning
  - 32 (78%) Develop policies and procedures for cleaning
  - 17 (41%) Improve regular training programs to include all staff that clean
  - 17 (41%) Develop audit/feedback process for cleaning
- Surveillance & Disease Reporting
  - 21 (51%) Develop policies and procedures for conducting surveillance

# Recommendations

- PPE
  - 28 (68%) Develop an audit/feedback process - not just for contact precautions
- Hand Hygiene
  - 21 (51%) Provide feedback from audits, facility-level and individual-level
  - 15 (37%) Start more formal audit program
- Injection Safety & Point of Care Testing
  - 21 (51%) Develop a formal audit program
  - 20 (49%) Develop a formal feedback program
  - 16 (39%) Implement competency-based trainings



# Recommendations

- Respiratory hygiene/cough etiquette
  - 21 (51%) Implement Health Department recommendations for signage
- Infection Control Program & Infrastructure
  - Specific training in infection control for IP staff
- Healthcare personnel & Resident Safety
  - 13 (32%) Develop or update policies and procedures for TB testing/screening, HCW influenza vaccination



# Lessons Learned



No program is perfect—always room for improvement



Infection prevention involves a lot of departments- get to know your colleagues!



ICAR is a great tool and free resource to enhance your program

# How Can ICAR Help You?

- ✓ Collaborative process, NOT regulatory
- ✓ Focus on quality improvement
- ✓ Free consultation
- ✓ Strengthen your IP program
- ✓ Add another tool to your toolbox





**How do we prevent  
MDROs and infections?**

# Facility Level Prevention Strategies



**Hand hygiene**



**Personal  
Protective  
Equipment and  
Precautions**



**Meticulous  
environmental  
disinfection**



# Hand Hygiene





DEPARTMENT OF HEALTH & HUMAN SERVICES  
CENTERS FOR DISEASE CONTROL AND PREVENTION  
PATIENT SAFETY

# CLEAN HANDS SAVE LIVES

## Protect patients, protect yourself



Alcohol-rub or wash  
before and after **EVERY** contact.



[www.cdc.gov/handhygiene](http://www.cdc.gov/handhygiene)

# Barriers to Hand Hygiene (HH) adherence in NHs

**Workload**

**Access**

**Guidelines**

**Confusion with gloves**

**Lack of Education**

# Barriers to Hand Hygiene (HH) adherence in NHs

**Workload**



Forgot HH because of workload

**Access**



27.5% lack of alcohol-based hand rub

**Guidelines**



Belief that HH guidelines aren't applicable in LTC

**Confusion with gloves**



No HH because of glove use

**Lack of Education**

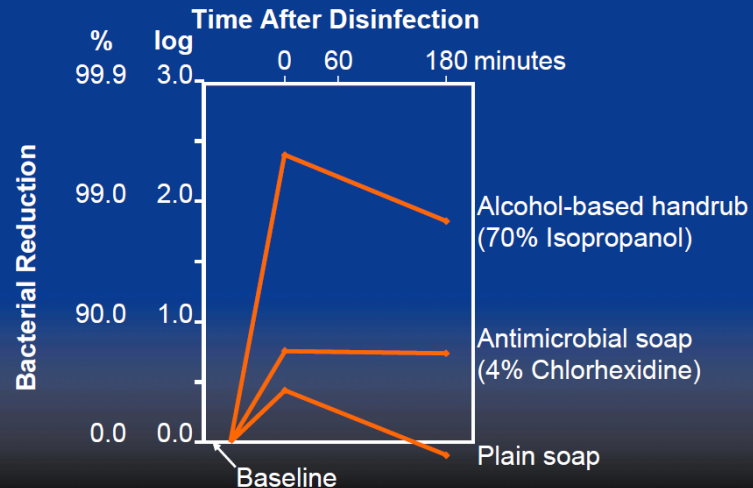


55% never/rarely received personal feedback on HH practices

# Efficacy of Hand Hygiene Preparations in Killing Bacteria



## Ability of Hand Hygiene Agents to Reduce Bacteria on Hands



Adapted from: *Hosp Epidemiol Infect Control*, 2<sup>nd</sup> Edition, 1999.

# The Truth about HH



**If hands are not visibly soiled,  
use an alcohol-based hand  
rub (ABHR)**



\$483.80  
Infection  
Control

*Literature:*

**ABHR** is a faster, more convenient, less drying method of HH for HCWs in a LTCF AND it **improved compliance**. ABHR was more efficacious than soap and water in removing pathogens already present on HCW hands.

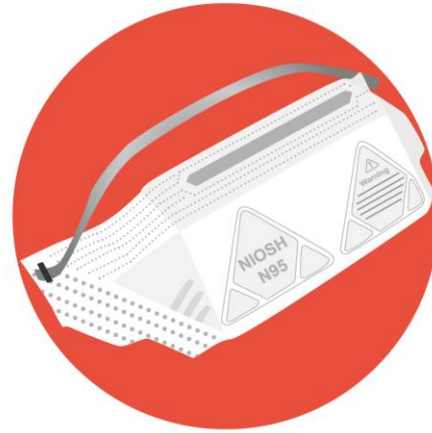
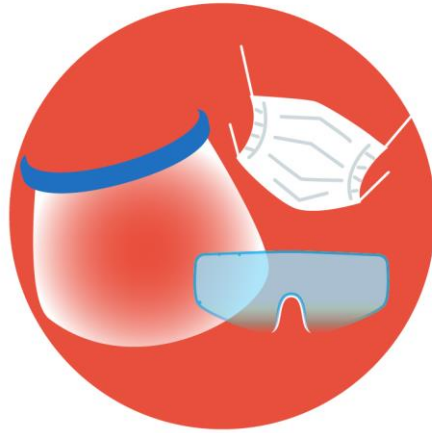
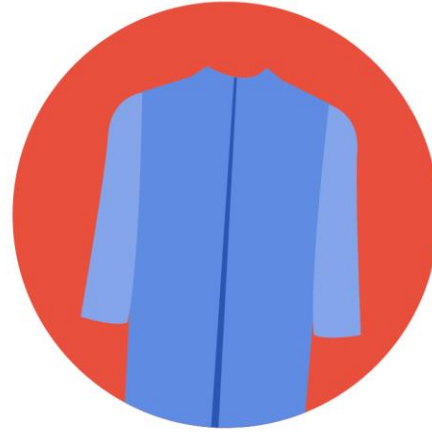
Mody L. et al. ICHE 2003; 24(3):165-171

“consistent with accepted standards of practice such as the **use of ABHR instead of soap and water in all clinical situations except when hands are visibly soiled** (e.g., blood, body fluids), or after caring for a resident with known or suspected C. difficile or norovirus infection during an outbreak, or if infection rates of C. difficile are high...”



# Personal Protective Equipment & Precautions







**BREAK THE CHAIN!**

- ✓ Immunizations
- ✓ Treatment of underlying disease
- ✓ Health insurance
- ✓ Patient education

**BREAK THE CHAIN!**

- ✓ Diagnosis and treatment
- ✓ Antimicrobial stewardship

**BREAK THE CHAIN!**

- ✓ Cleaning, disinfection, sterilization
- ✓ Infection prevention policies
- ✓ Pest control

**Infectious agent**

- Bacteria
- Fungi
- Viruses
- Parasites

**Susceptible host**

- Any person, especially those receiving healthcare.

**Reservoir**

- Dirty surfaces and equipment
- Animals/ insects
- People
- Soil (earth)
- Water

**Portal of entry**

- Broken skin/incisions
- Respiratory tract
- Mucous membranes
- Catheters and tubes

**Portal of exit**

- Open wounds/skin
- Splatter of body fluids
- Aerosols

**Mode of transmission**

- Contact (direct or indirect)
- Ingestion
- Inhalation

**BREAK THE CHAIN!**

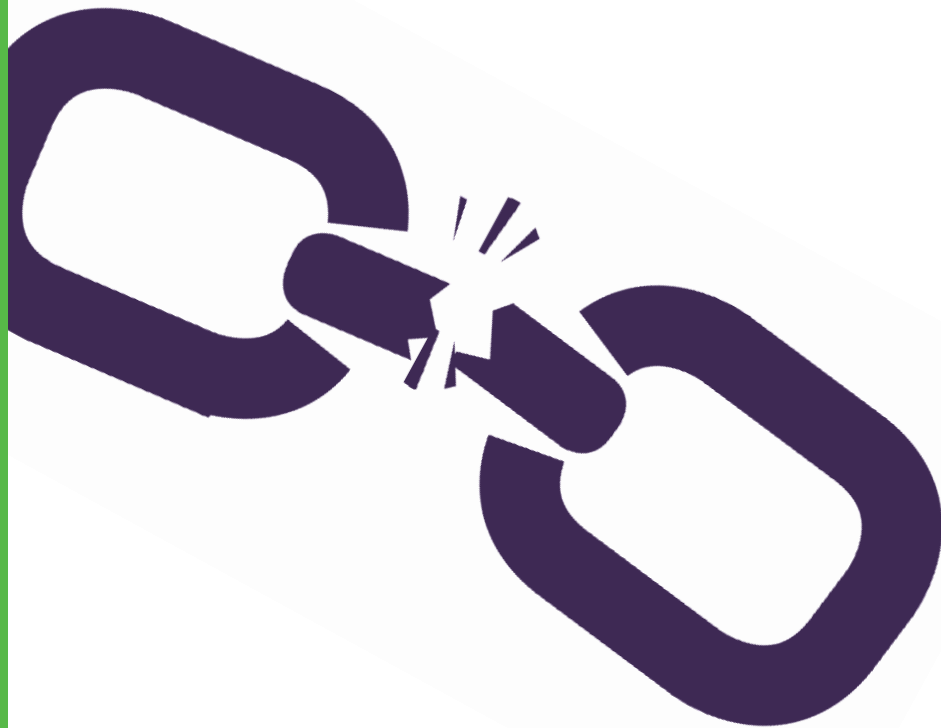
- ✓ Hand hygiene
- ✓ Personal protective equipment
- ✓ Personal hygiene
- ✓ First aid
- ✓ Removal of catheters and tubes

**BREAK THE CHAIN!**

- ✓ Hand hygiene
- ✓ Personal protective equipment
- ✓ Food safety
- ✓ Cleaning, disinfection, sterilization
- ✓ Isolation

**BREAK THE CHAIN!**

- ✓ Hand hygiene
- ✓ Personal protective equipment
- ✓ Control of aerosols and splatter
- ✓ Respiratory etiquette
- ✓ Waste disposal



Association for Professionals in  
Infection Control and Epidemiology

Learn how healthcare professionals can break the chain of infection:

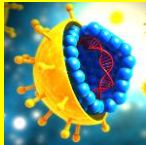
[www.apic.org/professionals](http://www.apic.org/professionals)

© 2016 APIC

# Routes of Transmission of Infectious Pathogens

## Direct and Indirect Contact Transmission

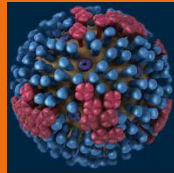
Hepatitis B



C.diff

## Droplet Transmission

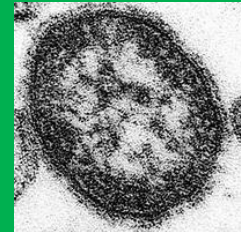
Influenza virus



Group A  
Streptococcus

## Airborne Transmission

Mycobacterium TB



[hms.harvard.edu](https://hms.harvard.edu)



Measles



[Slate.com](https://slate.com)

Chicken Pox virus

# Standard Precautions

- Group of infection prevention practices

Hand Hygiene	Respiratory hygiene and cough etiquette
Personal Protective Equipment	Environmental cleaning and disinfection
Safe injection practices	Reprocessing of reusable medical equipment

- Applies to all residents regardless of suspected or confirmed infection status
- All blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes may contain transmissible infectious agents

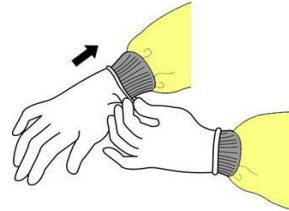
## Standard & Transmission-Based Precautions

### Standard Precautions

- Hand hygiene
- PPE
- Safe injection practices
- Respiratory hygiene and cough etiquette
- Environmental cleaning and disinfection
- Reprocessing of reusable medical equipment

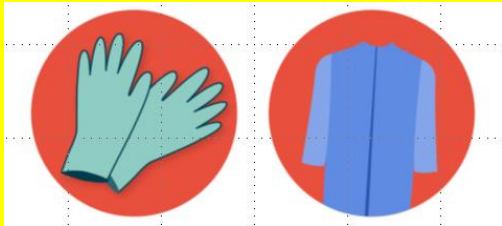
### Transmission-Based Precautions

- Contact Precautions
- Droplet Precautions
- Airborne Precautions



# Transmission-Based Precautions

## Contact Precautions



## Droplet Precautions



## Airborne Precautions



N95

# Transmission-Based Precautions

- Perform hand hygiene
- PPE donned before room entry
- PPE doffed and hand hygiene performed before room exit or provided care for another resident
- Ideally resident placed in private room
- Consider cohorting
- Clear signage, easy access to ABHR, PPE, restock supplies

## Standard & Transmission-Based Precautions

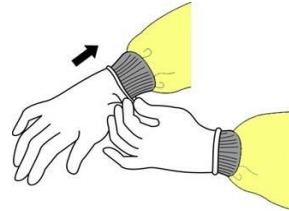
### Standard Precautions

- Hand hygiene
- PPE
- Safe injection practices
- Respiratory hygiene and cough etiquette
- Environmental cleaning and disinfection
- Reprocessing of reusable medical equipment

### Enhanced Barrier Precautions

### Transmission-Based Precautions

- Contact Precautions
- Droplet Precautions
- Airborne Precautions



# Enhanced Barrier Precautions

- The use gowns and gloves during high-contact resident care activities
  - Dressing
  - Bathing
  - Transferring
  - Providing hygiene
  - Changing linens
  - Changing briefs or assisting with toileting
  - Device care or use of a device (urinary catheter, central line, feeding tube, tracheostomy)
  - Wound care (any skin opening requiring a dressing)

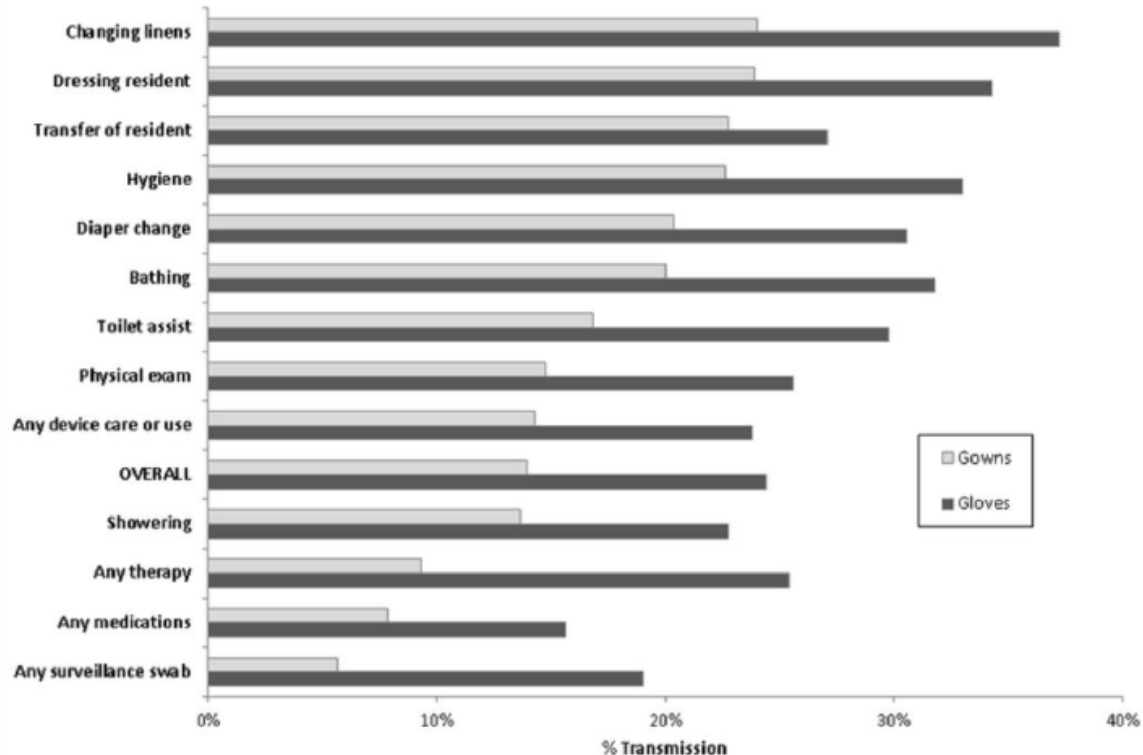


Mary-Claire Roghmann



# MRSA Transmission to Gowns and Gloves of HCW during care of MRSA colonized residents

- Highest Risk:
  - Dressing
  - Transferring
  - Providing hygiene
  - Changing linens
  - Toileting
- Lowest Risk:
  - Giving meds
  - Glucose monitoring



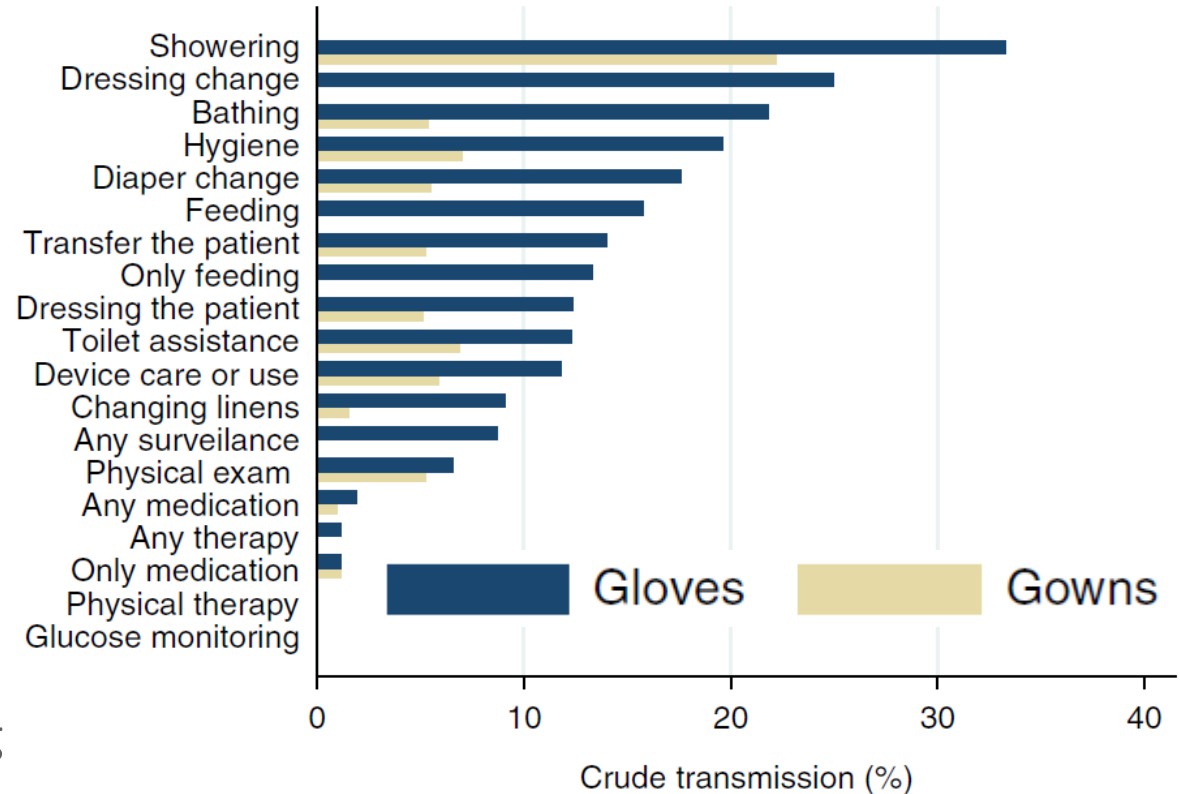
# Resistant Gram-negative Bacteria (RGNB) Transmission to Gowns and Gloves of HCW during care of RGNB colonized residents

## ■ Highest Risk:

- Showering
- Hygiene
- Toileting
- Wound dressing changes

## ■ Lowest Risk:

- Assist feeding
- Giving meds
- Glucose monitoring



# When to use Contact Precautions for MDRO colonized or infected residents

- Wounds, secretions, or excretions that are unable to be covered or contained,
- For preventing spread of rare and highly resistant pathogens,
- On units or in facilities where, despite attempts to control the spread of MDROs, ongoing transmission is documented or suspected.

	Applies to:	PPE used for these situations:	Required PPE	Room restriction
<b>Contact Precautions</b>	All residents infected or colonized with MDROs in specific situations	<ul style="list-style-type: none"> <li>• Presence of wounds, secretions, or excretions that are unable to be covered or contained</li> <li>• With rare and highly resistant pathogens (novel, pan-resistant)</li> <li>• On units or in facilities where, despite attempts to control the spread of MDROs, ongoing transmission is documented or suspected</li> </ul>	Gloves and gown on EVERY room entry	Yes, except for medically necessary care.
<b>Enhanced Barrier Precautions</b>	All residents infected or colonized with MDROs when Contact Precautions does not apply	During high-contact resident care activities: <ul style="list-style-type: none"> <li>• Dressing</li> <li>• Bathing</li> <li>• Transferring</li> <li>• Providing hygiene</li> <li>• Changing linens</li> <li>• Changing briefs or assisting with toileting</li> <li>• Device care or use of a device: central line, urinary catheter, feeding tube, tracheostomy</li> <li>• Wound care: any skin opening requiring a dressing</li> </ul>	Gloves and gown (must change between residents)	None.

# Cleaning & Disinfection



# Room for Improvement: Environmental Cleaning

- Multiple use devices reused without cleaning
- Insufficient time for cleaning/disinfection given staffing constraints
- Proximity of resident supplies to sink and toilet
- Inappropriately performed terminal cleaning
- Insufficient contact time after using wipes
- Lapses regarding separation of clean/dirty



## Case Example

- 79 year old resident is admitted to an acute care hospital from the nursing home with a urinary tract infection
- Short-stay resident on nursing home's skilled nursing unit for wound care
- Medical History: Type 2 Diabetes mellitus, hypertension, left leg wound, urinary retention requiring urinary catheter
- Urine culture on admission grows *Acinetobacter* resistant to Carbapenem antibiotics
- Further testing indicates OXA-23 carbapenemase production

## Case Example, continued

- Health department notifies nursing home of laboratory result and recommends an investigation
  - Resident had no prior MDROs; not in Contact Precautions, has roommate
  - Laboratory lookback: 2 reports of resistant *Acinetobacter*
  - Point Prevalence survey: 3 residents with OXA-23
  - ICAR

IX. Environmental Cleaning	
Elements to be assessed	Assessment
A. The facility has written cleaning/disinfection policies which include routine and terminal cleaning and disinfection of resident rooms.	<input type="radio"/> Yes <input type="radio"/>



## Case Example: ICAR Results

- Trained, experienced IP
- ABHR and gloves available immediately inside of every resident room
- Early stages of starting an auditing & feedback program for hand hygiene and environmental services
- Limited access to gowns
- Confusion over responsibility for cleaning shared equipment
- Limited access to cleaning & disinfectant wipes



***Acinetobacter***



Kwipped.com



<https://5.imimg.com>

***Candida auris***



# Transitions of Care

## INFECTION CONTROL TRANSFER FORM

(Discharging Facility to complete form and communicate information to Receiving Facility)

Demographics	Patient/Resident		Date of		Discharge
	<i>Last Name</i>				
	Sending Facility Name:		Contact Name:		Contact Phone:
	Receiving Facility Name:				

Precautions	Currently in Isolation Precautions? <input type="checkbox"/> Yes	<input type="checkbox"/> No Isolation Precautions
	If Yes check: <input type="checkbox"/> Contact <input type="checkbox"/> Droplet <input type="checkbox"/> Airborne <input type="checkbox"/> Other: _____	

Did or does have (send documentation):	Current Infection, History, or Ruling Out*
Multiple Drug Resistant Organism (MDRO):	<input type="checkbox"/> Yes
MRSA	<input type="checkbox"/>

# Facility-level Prevention

- Surveillance: Be aware of MDROs
- Policies and procedures: infection prevention, EVS, Resident & staff health programs
- Education & competency-based training for healthcare providers
- Communication at transitions of care
- Minimize use of invasive devices, appropriate device care
- Promote antibiotic stewardship
  
- Use your resources!
- Engagement at all levels is essential

# CDC Nursing Home IP Training Course

- ❑ 23 web-based, self-study modules; close to 20 CE hours
- ❑ Curriculum designed to cover the core activities and practices of a NH IPC program
- ❑ Based on CDC guidance and best-practice recommendations
- ❑ Target audience – nursing home staff given responsibility for IPC program implementation

<https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Downloads/QSO19-10-NH.pdf>

DEPARTMENT OF HEALTH & HUMAN SERVICES  
Centers for Medicare & Medicaid Services  
7500 Security Boulevard, Mail Stop C2-21-16  
Baltimore, Maryland 21244-1850



Center for Clinical Standards and Quality/Quality, Safety & Oversight Group

Ref: QSO-19-10-NH

DATE: March 11, 2019

TO: State Survey Agency Directors

FROM: Director  
Quality, Safety & Oversight Group

SUBJECT: Specialized Infection Prevention and Control Training for Nursing Home Staff in the Long-Term Care Setting is Now Available

## Memorandum Summary

- The Centers for Medicare & Medicaid Services (CMS) and the Centers for Disease Control and Prevention (CDC) collaborated on the development of a free on-line training course in infection prevention and control for nursing home staff in the long-term care setting.
- The training provides approximately 19 hours of continuing education credits as well as a certificate of completion.
- The "Nursing Home Infection Preventionist Training Course" is located on CDC's TRAIN website ([https://www.train.org/cdctrain/training\\_plan/3814](https://www.train.org/cdctrain/training_plan/3814)).
- This memo supersedes memo Quality, Safety & Oversight policy memorandum QSO

# Lessons Learned and Moving Forward

- How can we better address prevention and containment of MDROs?
- What steps have you taken?
- Roadblocks? Successes?
- How can we provide further support?
- What resources would be most useful?
- **Feedback on Enhanced Barrier Precautions**



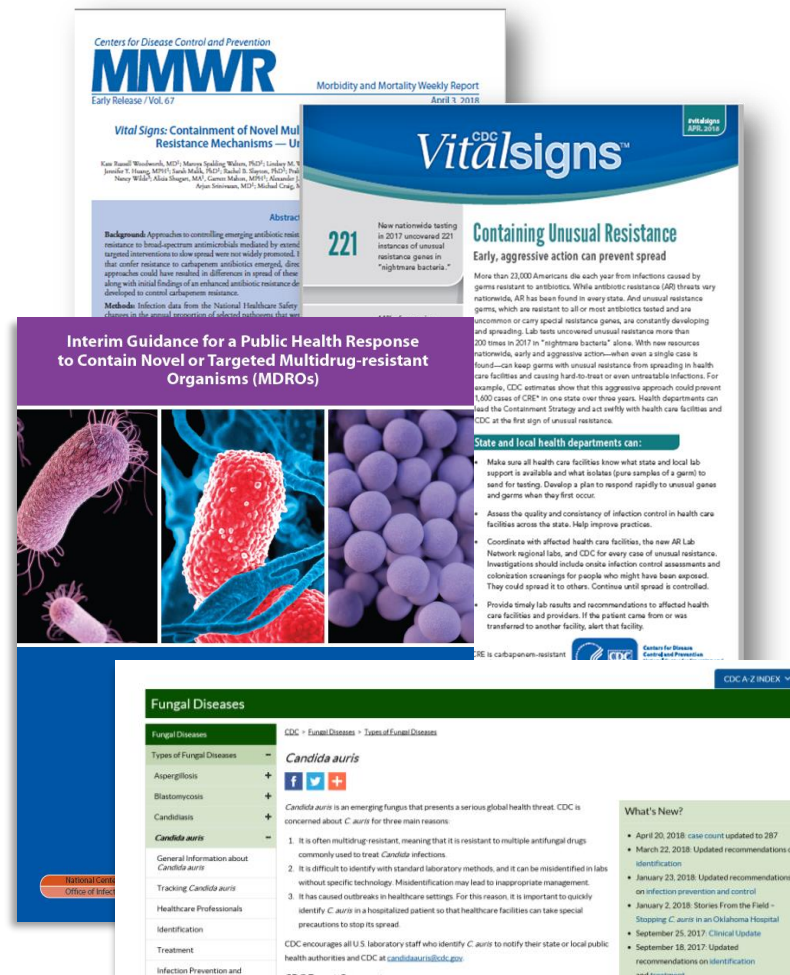
# What Facilities Can Do

- **Plan for unusual resistance arriving in your facility.** Find resources: [www.cdc.gov/hai/outbreaks/mdro](http://www.cdc.gov/hai/outbreaks/mdro)
- **Leadership:** Work with the health department to stop spread of unusual resistance. Review and support infection control in the facility.
- **Clinical labs:** Know what isolates to send for testing. Establish protocols that immediately notify the health department, healthcare provider, and infection control staff of unusual resistance. Validate new tests to identify the latest threats. If needed, use isolates from [www.cdc.gov/ARIsolateBank](http://www.cdc.gov/ARIsolateBank).
- **Healthcare providers, epidemiologists, and infection control staff:** Place patients with unusual resistance on contact precautions, assess and enhance infection control, and work with the health department to screen others. Communicate about status when patients are transferred. Continue infection control assessments and colonization screenings until spread is controlled. Ask about any recent travel or health care to identify at-risk patients.



# Resources

- Interim Guidance to Contain Novel MDROs
  - <https://www.cdc.gov/hai/containment/guidelines.html>
- CDC CRE Toolkit
  - <https://www.cdc.gov/hai/containment/guidelines.html>
- Vital Signs on Containment
  - [https://www.cdc.gov/mmwr/volumes/67/wr/mm6713e1.htm?s\\_cid=mm6713e1\\_w](https://www.cdc.gov/mmwr/volumes/67/wr/mm6713e1.htm?s_cid=mm6713e1_w)
- CDC *Candida auris* webpage
  - <https://www.cdc.gov/fungal/diseases/candidiasis/candida-auris.html>
- Find your state HAI Coordinator and AR expert
  - <https://www.cdc.gov/hai/state-based/index.html>





# Thank you!

## Questions?

MollonN@Michigan.gov  
ipf8@cdc.gov

For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

**CDC** Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives. Protecting People™

SEARCH

CDC A-Z INDEX

### Nursing Homes and Assisted Living (Long-term Care Facilities [LTCFs])

[f](#) [t](#) [+](#)

Nursing homes, skilled nursing facilities, and assisted living facilities, (collectively known as long-term care facilities, LTCFs) provide a variety of services, both medical and personal care, to people who are unable to manage independently in the community. Over 4 million Americans are admitted to or reside in nursing homes and skilled nursing facilities each year and nearly one million persons reside in assisted living facilities. Data about infections in LTCFs are limited, but it has been estimated in the medical literature that:

- 1 to 3 million serious infections occur every year in these facilities.
- Infections include urinary tract infection, diarrheal diseases, antibiotic-resistant staph infections and many others.
- Infections are a major cause of hospitalization and death, as many as 380,000 people die of the infections in LTCFs every year.

**CLINICAL STAFF INFORMATION**  
Fact sheets, guidelines, reports, and resources

**RESIDENT INFORMATION**  
Fact sheet, patient safety and other information

**PREVENTION TOOLS**  
Checklists, fact sheet, toolkits, and additional links

**HEALTH DEPARTMENT RESOURCES**  
State-developed resources and information

**The Core Elements of Antibiotic Stewardship for Nursing Homes**

The Department of Health and Human Services has developed a strategy to address infections in Long-term Care Facilities in Phase 3 of the **National Action Plan to Prevent Health Care-Associated Infections: Road Map to Elimination** [↗](#)

Making nursing homes better places to live, work and visit. **Advancing Excellence in America's Nursing Homes** [↗](#)

<http://www.cdc.gov/longtermcare>

	Applies to:	PPE used for these situations:	Required PPE	Room restriction
<b>Contact Precautions</b>	All residents infected or colonized with MDROs in specific situations	<ul style="list-style-type: none"> <li>• Presence of wounds, secretions, or excretions that are unable to be covered or contained</li> <li>• With rare and highly resistant pathogens (novel, pan-resistant)</li> <li>• On units or in facilities where, despite attempts to control the spread of MDROs, ongoing transmission is documented or suspected</li> </ul>	Gloves and gown on EVERY room entry	Yes, except for medically necessary care.
<b>Enhanced Barrier Precautions</b>	All residents infected or colonized with MDROs when Contact Precautions does not apply	During high-contact resident care activities: <ul style="list-style-type: none"> <li>• Dressing</li> <li>• Bathing</li> <li>• Transferring</li> <li>• Providing hygiene</li> <li>• Changing linens</li> <li>• Changing briefs or assisting with toileting</li> <li>• Device care or use of a device: central line, urinary catheter, feeding tube, tracheostomy</li> <li>• Wound care: any skin opening requiring a dressing</li> </ul>	Gloves and gown (must change between residents)	None.